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PSYCHOLOGICAL TESTS

This issue reviews and brings down to date the issues of this Review of Educational Research for June, 1932, entitled *Tests of Personality and Character*, and for October, 1933, entitled *Tests of Intelligence and Aptitude*.

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Volume V

June, 1935

Number 3

PSYCHOLOGICAL TESTS

(Literature reviewed from January, 1932, to January, 1935)

Prepared by the Committee on Psychological Tests: Gertrude Hildreth, Willard C. Olson, Herbert Toops, Goodwin Watson, and Harry J. Baker, *Chairman*; with the cooperation of G. Frederic Kuder.

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INTRODUCTION

IN THIS NUMBER of the *Review of Educational Research* the topic of psychological tests covers tests of intelligence, aptitude, personality, and character. Reviews of these topics in the first cycle of the *Review* proved to be so voluminous that separate numbers were issued on tests of personality and character in June, 1932, and on tests of intelligence and aptitude in October, 1932. The present issue covers the three years 1932, 1933, and 1934; but even in this brief period the task of selecting important reports of research has been arduous, and literally thousands of them have necessarily been eliminated.

A review of psychological tests offers certain unique problems of selection which are difficult to treat satisfactorily. The discussions should be concerned primarily with the nature of the traits to be tested. But the nature of psychological traits are partly matters of rational deduction and philosophical formulation, and as such cannot be expressed as standard deviations or as coefficients of correlation. Although statistical devices are convenient vehicles for evaluating research, theories of trait constitution cannot be omitted or ignored in reports of research.

A second difficulty is that of presenting reports of research in the light of valid statistical formulas, without placing too much or too little emphasis upon statistical validity. In response to demands for greater emphasis upon the importance of statistical procedures, Dr. Toops has prepared a chapter of this issue dealing with that topic. His critical review of this field should be of interest to workers in fields of measurement other than psychological tests. Research confronts on one hand the danger of making deductions from data which are not statistically valid, and on the other that of becoming top-heavy and cumbersome with the necessary technics of validation.

Critical evaluations of psychological tests cannot be limited to the tests themselves, but must consider applications of results to specific situations, groups, and populations. Therefore it is practically impossible to consider psychological tests without reporting on such topics as sex differences, the efficiency of special instructional methods, the phenomena of mental senescence, or any topic susceptible to psychological measurement. In these discussions the fields of test applications border on those of instruction, of social differences, in fact on the entire range of educational and psychological processes. These marginal fields are being discussed in this *Review* primarily from the standpoint of test technic and secondarily from the practical, utilitarian application of results.

In the preparation of this *Review* special mention should be made of the contributions of Dr. Olson, who not only was assigned duties as sub-chairman for the tests of personality and character, but who also prepared a substantial number of bibliographies and abstracts for all members of the committee.

HARRY J. BAKER, *Chairman,*
Committee on Psychological Tests.

CHAPTER I

Intelligence and Its Measurement

SOURCES of general information about intelligence testing are given in Pintner's annual summaries (87) which cover theories, new tests and texts, and results of studies and investigations. A comprehensive bibliography has been prepared by Hildreth (45). General texts on intelligence and its measurement are offered by Boynton (14), by Garrett and Schneck (34), and a second edition in 1931 by Pintner (86).

This chapter will review the nature of intelligence in its general and special aspects; the clinical interpretation of functions; mental growth and changes; test standardization and variability; new tests; and suggested topics for further research.

Nature of Intelligence

General ability—For some years a debate has been in progress between Spearman and Thorndike as to the nature of general intelligence. Spearman (104) offered a hypothesis that there is a general factor "G" which permeates all mental activity and invariably produces a positive correlation between any two types of mental tests. A second "S" factor (actually a group of "S" or specific factors) exists which comes to light, depending upon the unique type of mental activity being tested. Thorndike proposed a series of traits more or less closely related to one another rather than a strong central "G" factor. Spearman (105) recently discussed this point by stating that an ability or trait which seems to be unitary may actually be a composite hidden in the various traits, and that the only safe procedure is not to assume what the tests measure but to study their intercorrelations.

Bruckner (18) disagreed with Thorndike (113) on the assumption that only a quantitative factor is the fundamental cause of differences in intelligence such as is measured on the CAVD tests. Bruckner held that qualitative differences in the original endowment of associative power are more important bases, and that Thorndike's tests involve the danger of splitting intelligence into partial segments without ever getting a grasp of the total mental constitution.

R. C. Tryon (118) examined ten important investigations with one hundred or more subjects by the method of tetrad differences and concluded that since the tetrads dispersed around zero, the Spearman two-factor theory was not as consistent as a multiple-factor theory of intelligence. Spearman (105) answered, claiming irrelevancy, incorrect interpretation, and disregard for the group-factor concept. In two studies Piéron (84, 85) deduced the existence of four types of intelligence: verbal, numerical, logical, and one of "common sense." He emphasized that the intercorrela-

tions of these types are low which is also true between comprehension and invention. These latter two types, he believes, are the most common components of many intelligence tests. He contended that a whole series of mental tasks should be given which apply to all phases of learning rather than to what is ordinarily found in intelligence tests.

Thurstone (116) treated the theories of intelligence in somewhat the same manner as Piéron. He showed that Spearman's general factor and a second factor that is specific to each test or variable are actually only special cases within a multiple-factor theory. Eventually it will be possible to identify several mental abilities which reveal themselves as distinct and among them will probably be verbal ability, perceptual relations, and arithmetical ability. In the same discussion Thurstone reported the application of the multiple-factor theory to psychotic symptoms with the discovery of five clusters of symptoms, and also to vocational choices in which he found that there is a relatively small number of types of vocational interest groups.

These investigations with the improved statistical methods of analysis hopefully point to a better understanding of the nature of intelligence.

Special abilities—Investigations in the field of special abilities and disabilities have been comparatively meager, although certain new tests show some new attempts in this direction. When the analytical procedures proposed by Thurstone have better localized the special areas of intelligence, new tests will probably be developed to measure them. Many of the recent investigations on specific tests deal with tests of performance.

McElwee (63) analyzed the free association test included in the Stanford-Binet on 200 school children and found few association sequences, but in some cases children gave groups of objects in the same class. Hutt (48) offered a revision of the Kohs' Block Design Test, showing that of the three factors, success, speed, and moves, the third is of no value in increasing the diagnostic value or the validity of the test. Line and Ford (58) examined 705 children with the Knox Cube Test and found that the r with chronological age was low, with Binet M.A. was .58, and with school grade was .39. This test had low reliability and only four levels of difficulty. Edds (29) found very little in common between tests of verbal and non-verbal ability in measuring 53 college and 140 high-school students. Mental ages were developed for the separate tests or pages of the Detroit Group Intelligence Tests by Baker (7), and when taken with similar results for tests of mechanical aptitude afford a comprehensive profile of special abilities and disabilities. Wechsler (123) proposed a similar use of the subparts of the Army Alpha Test.

Performance and non-language tests—Several new tests in these fields will be mentioned later. Research projects on applications of such tests are few in number. Feinberg (31) reported correlations of Stanford-Binet and Pintner-Paterson tests on 807 children as being moderately positive with lower results for superior children and adults. Babcock (3, 5), using these same tests on adult foreigners, found them rating lower on the Stan-

ford-Binet than on performance. Lincoln (57) reported high reliability on odd-even items and low Binet correlation for the Lincoln Hollow Square Form Board.

Four hundred children, grades 4 to 8, were tested by Armstrong (1) with Army Beta, short Army Performance, and Otis Group tests. Although he found an r of .633 between Beta and Otis, he recommended a re-standardization of Beta up to thirteen years of age. Army Performance has a more satisfactory standardization, but a lower correlation of .629 with Otis. He recommended Army Performance for clinical practice.

Senour (100) tested children from foreign families in East Chicago with Haggerty Delta 2 and Pintner Non-Language Mental Test and concluded that language handicap was rather serious in the Haggerty Test. Mowrer (75) reported on the performance of 83 children aged twenty-four to sixty-four months on 18 items of the Merrill-Palmer Scale. Bradbury (15) applied the Descoeudres Performance Test to nursery-school children, and reported on test administration and validation, with an r of .56 with Stanford-Binet.

Clinical Interpretations

In the clinical interpretations of intelligence, attempts have been made to analyze responses to tests and testing situations as well as to report the gross responses in terms of intelligence quotient or mental age. Various phases will be considered briefly here, since there tends to be an overlapping with test applications in Chapter II and with special talents and defects reported above.

Speed—Beck (9, 10) reported two studies on the factor of speed. He (10) reviewed thirty-four studies which showed a correlation range from -.32 to .90 between speed and simple discriminative reaction; -.03 to .53 with serial reaction; .14 to .32 with speed of reading, etc.—generally low correlations. In his other study he (9) concluded that speed, as measured in the usual test content, is not a measure of intelligence. C. Tryon and Jones (117) interpreted a low correlation between speed, as measured by screen exposure of simple narrative material, and altitude on the Thorndike CAVD tests as showing no marked community of function between speed and altitude or level of intelligence. Freeman (32) found a few, though important, number of cases among 117 university students whose scores on the Ohio State University Psychological Test were influenced by varying the time limits. Graf (38) found considerable shifting of relative rank orders of 100 policemen in the early stages of a series of mental tests. Constancy of rank tended to be reached only when about 80 percent of the total time had elapsed which would be necessary to complete the entire test. Sutherland (108) concluded that speed was a factor in intelligence only when the material was easy. Line and Kaplan (59) found that speed is not related to mental age, that it is subject to improvement with

practice, and that the alertness of young bright pupils is probably stimulated by competition with older pupils in their classes.

Qualitative phases—The manner of test response is constantly in need of observation. Reymert and Hartman (93) found the correlation between early and later trials on the Knox Cube Test raised from .36 to .40 when the most variable first trial was eliminated from the computations. They found no constant relationship between procedure and intelligence and that the former can be judged only by observation. Tulchin (119) and Blumenfeld (12) emphasized the importance of such attendant factors as fatigue, embarrassment, stability, social and economic status, and language handicap. Medrow (67) reported that the methods and attitude with which subjects carried out form-board tests reflected personality, speed, comprehension, concentration, precision, thoroughness, and similar traits. Nass (76) devised a test of constructing designs by twining string around a board with about 100 wooden pegs. In making entire copies of designs as well as in completing a design when only a part was shown there was a surprising uniformity of kinds of errors. Figures to be copied could not be grasped as wholes but had to be analyzed into parts; and awareness of partial success was necessary for further completion of the figures.

Interpretation in psychopathic cases—The unique and unusual responses of psychopathic patients to mental test situations have furnished many valuable diagnostic clues. Schott (99) gave two or more administrations of the Stanford-Binet Test to neuro-psychiatric cases and found no relationship between variability and I.Q. level. Correlations between I.Q.'s on first and second trial was approximately .9 but the tests were used mainly as a barometer of the upward or downward trend of mental functioning. Babcock (4) stressed the need of studying psychopathic individuals as to the time of responses to familiar test material, as to their impressions of new test data, as to a measure of educational level, and as to variability between two test ratings which reflects a disturbed status of sensory functions.

Binder (11) studied psychopathic, neurotic, and normal cases on the Rorschach Test. He discovered that relatively much more importance must be attached to the central mood reactions in psychopathic personalities than in neurotic, and more in neurotic than in normal; and conversely, adaptivity to the peripheral or environmental stimulus plays a lesser role in the psychopathic than in the neurotic, and less in the neurotic than in the normal. Takamine (109) devised a complex performance test which required coordination in three different types of reactions simultaneously. The right hand turned down the crank to roll down a band of geometrical figures in an irregular order, so that these figures appear and disappear in a constant stream in which the subject must count all of a specified kind, and tap with a counter for the total number of all figures. On this test it was found that normal children decrease their errors with age, with a remarkable development in ability after the twelfth year. Girls were faster than boys but made four times as many errors. Motormen inclined to accidents made more errors than normal persons. Mental defectives

finished in quick time but with many errors. In paralytic dementia, efficiency decreased to 70 percent, to 34 percent, and finally to complete inability. Dementia praecox patients remained at a relatively high level difficult to differentiate from neurasthenics. Traumatic neurosis patients had a low index of efficiency which became progressively worse. From these sample studies it is evident that much valuable clinical information can be gleaned from observing test reactions, particularly in performance tests.

Mental Growth

The problem of mental growth has always been complicated by the varying content of tests at the several age levels, by differing degrees of test difficulty and by inadequate knowledge of growth curves, particularly at the adult levels. For a more complete discussion of this topic the reader is referred to the report of Stoddard's committee (106). This section considers mental growth in general, the constancy of the I.Q. within various groups, and the characteristics of adult mentality.

General studies—Jordan (49) gave various forms of the National Intelligence Tests to 183 children for six semi-annual intervals. The I.Q.'s remained fairly constant and growth curves were practically parallel at all I.Q. levels. Takamine (110) examined the same group of 109 Japanese children for the six-year compulsory school course. Ninety-two percent of all individuals' abilities were predicted with reasonable accuracy from the initial tests. Wilcocks (129) tested 16,574 pupils in South Africa of European descent from twelve to sixteen years of age and found an almost perfectly normal distribution of ability with standard deviations increasing slightly with chronological age. Growth could be expressed in terms of a hyperbolic equation. Wheeler (128) examined the mental growth of dull Italian children for four consecutive years with the Dearborn Group Intelligence Tests. He found that at time of school entrance they were retarded nearly a year mentally. This increased to over two and one-half years at the age of eleven years. His data showed that dull children reach their mental maturity earlier than normal and superior children.

Constancy of the I.Q.—Nemzek (78) reviewed 247 titles and found test reliabilities running mostly between .75 and .95, so that charges of gross unreliability are unwarranted. P. Cattell (19) found a fictitious rise of four or five points in I.Q. due to familiarity with test material repeated within three or four months, but an insignificant gain when the interval between tests was six months or longer. R. R. Brown (17) reported twice as much variability in I.Q.'s when the interval between tests was from five to nine years than when it was less than two years, and that 25 cases in 100 change their I.Q. more than 15 points after a seven-year interval. Lincoln and Wadleigh (55) compared I.Q.'s of 150 children on three well-known group tests and found a shift of five points or less in 31.3 percent of the

cases, and a shift of ten points or more occurred in 36.9 percent of the cases. This change is only approximately one point or two greater than for individual tests.

Preschool studies—There have been relatively more studies of test variability and mental growth changes at the preschool level than in any other age group. Wellman (124, 125, 126) made the most extensive studies in this field. In one of these studies she (126) found striking improvements in the I.Q.'s, especially by those below average. Gains in test scores are associated with preschool attendance. In her most recent report she (125) found that children who remained in the University system were higher in I.Q. by about 8 points at the age of eight and one-half years than those who had transferred to other schools. Non-preschool children made no change in I.Q. but matched preschool children made substantial gains.

It would be better to think of intelligence test results as representing intellectual status at the moment and to proceed cautiously on the problem of precise prediction until more is known about variations under differing conditions. Certainly intelligence cannot be regarded as static; it should be regarded in terms of growth rather than as a fixed quantity. Nevertheless, there are probably definite constitutional limits within which growth may be altered (125:80-81).

Hallowell (42) tested 438 children from three to forty-seven months of age and retested at ages from one to eight years. Test-retest variations of less than 5 points occurred in 48 percent to 55 percent of the cases, and 10-point variations included from 78 percent to 88 percent, mostly in the direction of improvement which he ascribed to change of environment and to development of language. Furfey and Muehlenbein (33) found that scores on the Linfert-Hierholzer scale administered in the second year of life did not predict Stanford-Binet scores four years later.

Additional experimental studies on other mental phenomena of preschool children were conducted by Shacter (101) who described a method for measuring sustained attention, Poyntz (89) on the efficacy of visual and auditory distractions, Rüssel (97) on form comprehension of two- to five-year-old children, K. A. Miles (70) on sustained visual fixation, Hurlock and Newmark (47) on memory span, and Grigsby (41) on the development of concepts of relationship as evidenced by their expressive ability.

The mentally gifted and superior—Nemzek (79, 80) reported two studies on the I.Q. constancy of the mentally gifted. In one study of 52 children on the Herring-Binet, test-retest ratings correlated $.73 \pm .04$, with a range in change of I.Q. -19 to 22, as contrasted with $.98 \pm .01$, and -3 to 8 respectively for average children. The average children were retested within twenty-four hours as against a one-year interval for the gifted. Lincoln (56) reexamined 92 children with I.Q.'s of 119 or over at intervals from five to eight years. He found that I.Q.'s tend to decrease and that girls' are likely to decrease more than boys'. P. Cattell (20) found I.Q. trends in 288 superior children just the opposite of Lincoln's results and of two Stanford University investigations.

The feeble-minded—Woodall (130) reported an average trend of -0.45 points in I.Q. per year in 497 institutionalized feeble-minded from six to sixteen years in chronological age; but above sixteen years of $.99$ points per year. Statistically significant upward trends occurred in 6.2 percent of the cases and downward trends in 8.2 percent. Girls were more variable than boys, morons more variable than imbeciles, and imbeciles more than idiots. A similar trend in I.Q. by age was discovered by Hoakley (46) in 550 cases. Fifty percent of all her cases were constant to within 5 points in I.Q. and extreme variable cases showed various causative factors.

Other groups—Gildea and Macoubrey (37) reported on 431 white patients of the Institute for Juvenile Research, Chicago, and found that 77, or 18 percent, had I.Q. changes of more than 10 points. They compared 73 of these with a similar number whose I.Q.'s had changed 5 points or less. Degree of cooperation, attitude toward examiner, and speed showed no relationship to variability, and degrees of reflectiveness and attention were slightly more favorable in the group whose I.Q. advanced. Improvements in physical condition, in parental attitudes, and in symptomatic behavior were definitely associated with I.Q. variability. Richey (94) made a comparison of 204 children whose naso-pharyngeal condition was satisfactory with 100 needing attention, and with 104 who had had their physical corrections. Removal of tonsils and adenoids had no measurable effect upon the I.Q. McAlpin (62) tested all the negro children in the 3A and 5A grades of two schools in Washington, D. C. The 3A children born in the District had an average I.Q. of 98.1; those born outside, 92.1. Similar figures of 95.1 and 89.7 were found for the 5A grade. The author concluded that the favorable environment stimulated mental capacities in the District.

Mental variability in adult levels and senescence—This topic is also discussed in Chapter II with respect to test applications. The chief studies have been made by W. R. Miles (68, 71, 72) who gave a series of psychological tests to persons from ten to ninety years of age. He found a rise in certain mental functions up to middle life and with considerable decline at senescence. Visual acuteness showed a slight decline up to age forty-nine, and 48 percent at age seventy to eighty-nine. In rotating speed of a small hand-drill mechanism, ages eighteen to twenty-nine showed the maximum scores; in hand promptness, ages fifty to sixty-nine; in foot promptness, ages eighteen to forty-nine; in immediate memory and judgment for position in spatial relations, ages thirty to forty-nine; in good judgment on an intelligence test, ages eighteen to twenty-nine. In general, mental efficiency at senescence declined about one-half of the maximum, which was reached at or near the age of fifty years. Sorenson (103) tested 641 university extension students ages sixteen to seventy with the Minnesota College Aptitude Test and Reading Examination and found that the curve for vocabulary ability increased with chronological age but paragraph meaning remained relatively constant. Mental use or disuse were chief causes of changes in curves of adult ability.

Test Standardization and Variability

A general discussion of statistical procedures is presented in Chapter IV. However, a report seems necessary here on specific studies dealing with mental-test standardization and reliability.

Test standardization—C. W. Brown, Bartelme, and Cox (16) presented a discussion of a scoring device for use with tests scaled according to the Thurstone absolute scaling technic. They used Gesell's Developmental Schedule and the California First Year Mental Scale for sampling material and presented advantages and disadvantages of the method. Several independent investigations have been made on the standardization of items on the Stanford-Binet. Wallin (122) and Phillips (83) showed the need for better standardization at its adult levels. Madden (66) found an increase rather than a decrease in the successes in year 9 over 8 for mentally slow children. Stoke (107) discovered that tests one and six of year 8 were more difficult than any other tests of 8 or 9. Test six in year 9 was found to be the easiest of that year, and Madden had found it to be second most difficult. Skalet (102) reported that tests involving interest in numbers, time, and geometrical form were relatively difficult, while tests of comprehension were easy. The author recommended the reevaluation of the I.Q. in the light of test difficulty. Louden (61) studied the two Stanford vocabulary lists and found that List 1 is decidedly easier than List 2 at the lower mental levels, approximately equal at the fourteen-year level, and more difficult above that point.

R. B. Cattell and Bristol (23) selected a new series of tests, inference stories, and puzzle boxes, and concluded that tests involving action and concrete material were most attractive to children but make the least demand upon intelligence; the best tests require either education of relationships or effectiveness of immediate memory. Radosuska-Strzemecka (91) standardized defining 15 words out of a list of 100 on subjects five to nineteen years of age. He proposed a seven-step scale of definitions ranging from pointing to the object to complete generalization. Perkins (81) studied Stanford-Binet test performance with respect to brightness. Tests IX-3, IX-1, XII-7, and XIV-4 are definitely "experience" tests, since more retarded children than superior children are able to pass them. Tests VIII-3, VIII-4, XII-8, X-2, X-3, XII-4, and XII-6 are passed more by superior than by retarded children.

Other tests—Vernon (121) reported a bibliography of eighty-four titles on test diagnosis for aptitudes, intelligence, and mental defects. He criticized the standardization of the Rorschach ink-blot test but was favorable to its qualitative significance. Lossagk (60), Levitov (54), Elderton (30), Bowers (13), and Cavalcanti (24) reported standardizations of visual imagery tests and spatial relationships. Lendzion (53) and Lahy (52) standardized tests for arranged numbers in serial order, with a positive correlation between short time of performance and good working methods. Wreschner (131) experimented with tests of judgment of characteristics

common to several objects for children six or seven years of age. Attention was easily distracted, the field of vision small, abstract thinking rare, and perseveration strong.

Peterson and Peterson (82) reported on separate answer strips to allow for repeated use of blanks, and the Perfo-Scorer, the Thermo-Scorer, and the Chemo-Scorer with sensitive ink as devices to reduce the cost of test material.

Arthur (2) presented the process of standardization of her Point Performance Scale. Thomas (111) standardized the Phillips Group Scale on 5,900 children in Perth, West Australia, with the higher social group consistently better than the lower social group. Coutinho (27) added to the standardization of the Pernambucan revision of the Stanford-Binet for children three or four years of age. McElwee (64) presented norms for ages five to thirteen on the Ellis Memory Test for Objects.

Test comparability—Several investigations have attempted to compare results of various intelligence tests, and to explain the differences. The writer has found that the discrepancy between group intelligence and Stanford-Binet mental ages is due to the fact that the group tests measure "area" of intellect and the Binet is more a test of "altitude" according to Thorndike's description. Mentally retarded children earn higher and mentally accelerated children earn lower group than Binet mental ages on account of greater "area" scores for the retarded arising from greater chronological ages, and vice versa. This difference between tests may be approximated by deducting two months mental age for each year's difference between chronological age and group mental age. For example, a retarded pupil fifteen years of age testing nine years on the group test will tend to earn about eight years mental age on the Stanford-Binet; a mentally accelerated child six years of age, testing nine years on group tests, will tend to have a Binet mental age of nine years and six months. It will be noted that the identical group score for a mental age of nine years will be equivalent to Binet eight years in one instance and nine years six months in the other. P. Cattell (22) found both theoretically and empirically that there is a constant difference between the Binet I.Q. and Otis I.Q. at the extremes, especially the upper extreme. McElwee (65) found a correlation of .717 on 45 subnormal children between the Goode-nough Intelligence Test and Stanford-Binet.

Group test equivalent scores—A manual for determining the equivalence of mental age obtained from group intelligence tests has been prepared by Runnels (96). Moore and Trafton (74) reported on equating scores for 235 Mount Holyoke freshmen on Terman Group A, Otis S-A, Army Alpha Form 8, and Miller Form A. A comparison was made by Miller (73) on results of six annual individual examinations of 160 subjects tested with five group examinations on the same day. The group results compare very favorably with results of the repeated individual examinations. Thomson (112) reported on two English investigations on standardization of group intelligence tests. Graf (39) explained discrepancies

between German tests as due to differences in content. The Beltz test unduly stressed arithmetic; the Bobertag-Hylla test overemphasized logical thinking.

Durling (28) and Updegraff (120) arrived at different conclusions as to the reliability of Stanford-Binet on young children. Durling found them lower than Updegraff. Nemzek (77) found no consistent difference between Stanford and Herring I.Q.'s on 52 superior children. The question of a suitable C.A. divisor for Binet I.Q.'s was considered by Rappaport (92), who found a decreasing I.Q. for sixteen years, the smallest change for fifteen years, and no criteria satisfied in using fourteen years. The Heinis' personal constant as a suitable substitute for the I.Q. was urged by Hilden (44) and P. Cattell (21).

New Tests and Revisions

Group tests—The Cleveland Kindergarten Classification Test devised by Rockwell, Hawkins, and Connor (95) can be administered to groups of ten or twelve pupils at a time, and has ten subparts under the four heads of motor control, sense discrimination, English, and graphic expression. A few parts must be administered individually.

Pintner (88) has developed a group test in two forms (A and B) for grades 4 to 8 inclusive which requires about forty-four minutes to administer, testing vocabulary, logical selection, arithmetical reasoning, best answer, number sequence, classification, opposites, and analogies. Henmon and Nelson (43) presented Forms A and B, one set for elementary grades 3 to 8, the other for grades 7 to 12, with 90 items and a thirty-minute limit. Greene (40) devised the Michigan non-verbal series for ages five to twenty with four equivalent batteries for aiming, tapping, feature discrimination, and pencil maze. Norms are available on approximately 300 white persons with both sexes represented at each age level.

Wells (127) prepared a revised short form of Army Alpha which compares favorably with the original form, although only four of the eight subtests are used. Thurstone and Thurstone (115) continue to issue annual revisions of the American Council Psychological Examinations for high schools and colleges which require sixty minutes of work time, usually with four tests of sentence completion, arithmetical problems, geometrical analogies, and synonyms-antonyms. Cleeton (25) devised the Carnegie Mental Tests for high school and college. C. C. and W. R. Miles (68) standardized the Otis S-A Test as a fifteen-minute test. Sargent (98) reported an adaptation of the Otis Classification Test suitable for blind children.

Individual tests—The most ambitious project in this field is by Gesell and others (35) who have prepared an atlas of infant behavior, a 900-page work of two volumes with 3,200 action photographs. The first volume is a normative series on posture and locomotion; early perception and prehension; perceptual, prehensory, and adaptive behavior. Volume two is a

naturalistic series of four boys and two girls of behavior patterns and episodes such as feeding, bathing, play, and sleep. Gesell, Thompson, and Amatruda (36) have presented an interpretation of the Atlas as to the genesis and growth of infant behavior.

Bayley (8) devised the California first-year mental scale with a test schedule of items from numerous sources. Norms are available on about 50 infants tested at an interval of about one year. Probst (90) standardized two forms of a general information test for children with 32 questions in 11 categories such as time, number, and simple mechanics. Kent (50, 51) reported a written and an oral test for clinic use. The latter has norms on 500 cases over the range from six to fourteen years with three overlapping point scales.

Baker and Leland (6) announced the forthcoming publication of the Detroit Tests of Learning Aptitude, a series of nineteen point scales each standardized on about fifty children at each suitable age level, with the median of the mental ages affording a general mental age. This test covers a wide range of verbal, spatial, number, motor-manipulative tests, auditory and visual spans, orientation and social adjustment which are symptomatic of special abilities and disabilities.

Cornell and Coxe (26) devised a Performance Ability Scale with seven tests including the Manikin-Proflie Test, the Block-Designs Test, the Picture-Arrangement Test, the Digit-Symbol Test, the Memory-for-Designs Test, the Cube-Construction Test, and the Picture-Completion Test, which is designed to measure non-language ability. Descriptive material is given on the following groups: American-foreign, manual-verbal, verbal-markedly-handicapped-in-language, emotionally dull-volitional, social-non-social, extrovert-introvert. This scale offers a fine supplement to the usual verbal tests, and tests of this type are certain to have much wider use in clinical applications than they have had in the past.

Foreign tests—There has been considerable activity in the development of foreign intelligence tests which will be mentioned by author and without citation of specific reference, according to countries.

A 1932 Mental Survey Test was devised and used by the Scottish Council for Research in Education. Marshall standardized Spearman's "Measure of Intelligence" on children of Perth, *Australia*. Hales reported a standardization of Army Alpha for Sydney, *Australia*. Chinese tests were reported by Hsiao who describes an intelligence test of multi-adaptability chiefly of number content, and by Ou-Ni-Lin who describes a Chinese version of Binet-Simon. South American activity at *Pernambuco* was typified by Arango on Ballard's test, by Barreto on a test similar to Army Alpha and Dearborn Tests, Oliveira on an Alpha test, Campos on the Binet-Simon. German projects were represented by Norden on new revision of Bobertag's version of Binet-Simon, by Hetzer and Koller with a series of four tests for the second year of life, by Schlötte on a test based on 1,000 dull children at Leipzig, and by Schlag with a traditional group test for elementary-school children. In *France* and *Belgium* Simon reported a five-minute examination for retarded children similar to Binet-Simon, and Frickx standardized the Simon P-V test on Brussels elementary children. Foucault, Piéron, Lahy, Decroly and Segers report various new test standardizations for the mentally gifted, and an adaptation of the Ballard test.

Summary and Suggested Research

Research into the nature of intelligence has been facilitated by the development of many new tests of specific traits and by Thurstone's methods of statistical analysis. Non-verbal and performance tests have been devised for many foreign speaking groups, and for other special groups such as the psychopathic. The influence of preschool attendance upon intelligence is still a question of debate since there seems to be considerable gain in test scores. Measurements in adult levels show that growth continues later in life, and with a decline in senescence more definitely expressed than in any earlier investigations. Scores between different intelligence tests and between group and individual tests have been equated. A considerable number of new tests has been developed which attempt to be more diagnostic of special abilities and disabilities.

Further research is necessary in all of these fields and in the relationships of intelligence to specific educational progress, to vocational success, to personality deviations, and to many similar factors.

CHAPTER II

Applications of Intelligence Testing

INTELLIGENCE TESTING continues to serve the school, the court, the clinic, and the research laboratory in the study and adjustment of children and adults. Readiness for instruction is verified through the administration of intelligence tests in many schools. Waste resulting from school failure is transformed into school success when mental abilities are considered in school assignments. Predicting high-school success has become a paramount issue in large high schools enrolling a cross-section of a heterogeneous population. Scholarships are awarded on the basis of intellectual maturity shown by the candidate, maturity gauged in part through standardized tests. Scholastic aptitude tests are regularly included in college admission requirements.

Intelligence testing aids the psychologist, the mental hygienist, the clinician in determining the mental status of patients and subjects, in predicting mental growth, in formulating therapeutic measures, in the disposition of criminal and delinquent cases. In the courts there is an increasing tendency to suit the punitive measures to the culprit in proportion to his mental responsibility. Psychological service in all its aspects becomes more reliable and effective through the use of mental capacity measures.

Personnel selection in industry, in civil service, in the professions, is facilitated by mental development and intelligence tests. From policeman to college professor, the vocational guidance expert inquires to what extent general mental ability is required in a given occupation, and to what extent the applicant has the requisite ability. For uniform ranking of all candidates the test technic proves indispensable in vocational guidance service. Candidates for professional training in nursing, medicine, teaching, take mental aptitude tests which constitute a part of the prognostic test battery used for selection.

Intelligence testing has proved its value as a tool for the study of mental development from infancy to old age; for determining the interrelationships of intellectual qualities; for determining the distribution and central tendencies of intelligence in population groups, and the range of individual differences in age, sex, and racial groups; for establishing the relation between mental and physical qualities; and for studying the gifted and subnormal individuals in the general population.

The effect of improved physical condition on thinking capacity, of varying environmental factors on mental development, is tested in part through mental measurement of population groups. Social problems, immigration, sterilization, birth control, crime control are being studied through the mediation of scientific mental aptitude measurement technics.

A more critical attitude toward intelligence measurement, as the outcome of continued experimentation, has resulted in more authoritative research findings, more sensible and intelligent interpretation of data. Testing instruments of improved reliability and validity are now available for research purposes.

Conflicting results from similar research studies still persist due to variations in sampling, inadequate controls, lack of refinement in measuring instruments, inadequate or improper test standardization.

Applications of intelligence testing will be reported in this chapter under the following captions:

1. General Interpretations and Surveys
2. Intelligence Testing for Scholastic Purposes
3. Clinical Applications of Intelligence Testing
4. Vocational Guidance
5. Individual Differences in Intelligence and Mental Development
6. Relation of Intelligence to Other Traits

General Interpretations and Surveys

In a comprehensive textbook for college students, Boynton (148) discussed the nature of intelligence and mental measurement methods. Garrett and Schneck (200) prepared a book to be used as a text and laboratory manual for the training of students. Nihard (281) wrote a text for the initiation of teachers in the test method. Pressey and Pressey (301) revised an earlier edition of an introductory handbook in the use of tests. Webb and Shotwell (353) included material on intelligence and achievement testing from nursery school through the elementary grades in a textbook on measurement. Most of these publications contain extensive bibliographies. A summary of books and articles on intelligence testing has been prepared each year by Pintner (296). Reymert (305) reviewed mental testing conducted in colleges, schools, and clinics during 1932.

Thurstone (342) applied his multiple factor analysis theory to the study of mentality. He suggested that the vectors of mind are: verbal ability, perceptual relations, arithmetical ability. Wallis (351) made a critical examination of some concepts in the field of testing children. Colucci (166) evaluated the mental testing movement. Crawford (171) urged caution in the interpretation of test results; F. S. Freeman (198) commented on the improper use of psychological tests; and Zachry and Lloyd (367) suggested that the proper interpretation of intelligence test results required judgment, experience, and wide study of each individual case.

The widest scale survey of school children yet reported was made by the Scottish Council for Research in Education (322). Uniform mental examinations were given to 87,498 children between the ages of ten and a half and eleven and a half, practically the entire population of such children in Scotland. Fick (189) reported a mental survey of 25 percent of the school children in the Union of South Africa. Wood (365) reported the aptitude and achievement testing results in a large number of inde-

pendent schools, and Woody (366) the testing program outcomes in a Michigan school system. Hildreth (216) prepared a bibliography covering the entire field of mental and educational testing, listing about 3,500 separate items. Kiesow (231) reported an effort in Italy to prepare a national collection of mental and physical tests, including apparatus, technics, tests, and questionnaires.

Intelligence Testing for Scholastic Purposes

Brown and Lind (156) concluded from intelligence and achievement tests of retarded and average school children that the relation of achievement to mental age depended not so much upon level of intelligence as upon the position of that level in the group instructed. Finzel (192) showed as the result of tests that the lack of relation between intelligence and school achievement was due to personality and developmental factors.

Heilman and McKee (213) studied the relation of achievement to intelligence and duration of school training and found that educational achievement is determined more by intelligence than length of school training. Bobertag (144) compared test scores of school children with their school marks. The tests had a higher coefficient of variability than the marks and the constancy of test results was better than that of the marks. The validity of test scores was .70. Witty and Brink (363) urged the adaptation of instruction to maturation levels. Foucault (194) emphasized the importance and described methods of measuring mental ability in school children.

Richards (307, 308) used a series of tests, including the Stanford and several auditory, visual, and form-board tests, in studying the abilities of first-grade children. He reported the relationship of psychological tests to school progress for 326 children. The average progress index was 90.

West (355) studied achievement resulting from ability grouping in the elementary school using over 4,000 pupils in grades three to seven. Results were given in terms of grade variability and needed adjustment in separate subjects. M. E. Broom (154) found a correlation of .73 to .80 between school achievement and mental tests in an elementary school. Engelhart (187) ascertained the contribution of mental ability to arithmetic problem solving and found that 25 percent of the variation in problem solving ability was due to variation in mental ability. Steiner (332) determined the annual variation in intelligence of first-grade children. Intelligence test scores proved to be a partial indication of success in later grades.

High school—Intelligence tests have been used for many purposes in the study of high-school problems. M. E. Broom and De Silva (152) concluded that achievement test batteries were reliable measures of the mental ability of junior high-school pupils, assuming that these pupils have had equal opportunities to learn. Turney and Fee (346) determined the relative value of five group mental tests applied to junior high-school pupils. Applying the criteria of discrimination and validity the tests were in ranked order: Otis Self-Administering, Terman Group Test, Haggerty Delta 2,

National, McCall Multi-Mental Scale. The first three are of about equal value. Bowman (147) studied variability in arithmetic problem solving by high-school pupils in relation to intelligence. There was less variation in performance shown by pupils of higher intelligence. Partial correlation between intelligence test results and secondary-school achievement computed by Collier (164) proved the intelligence tests to be the best predictive measure of several used, but a combination of three predictive measures proved to be most reliable. King (232) compared the value of nineteen mental and fourteen interest factors in high-school prediction and found the mental test the more reliable. Maller (258) determined that scholastic success in high school can be predicted from age at entrance with as much reliability from intelligence measured by standard tests. The intelligence quotient is slightly superior to raw score for high-school sectioning, according to the results of Symonds (335).

A survey by Mayer (268) of secondary-school pupils in several types of German schools proved the pupils enrolled in gymnasias to be most gifted. The pupils in the *Bürgerschule* did well; those of the *Realschule* poorly. Dowd (182) determined that high-school pupils are an intellectually selected group, judging from group intelligence test results obtained in the sixth grade. For predicting success in algebra, Ayers (140) found prognostic algebra tests, a reasoning test, and teachers estimates to be superior to the Terman Group Intelligence Test. Torgerson and Aamodt (344), however, found an algebraic ability test, an algebra prognosis test, and an intelligence test to be about equally valid for predicting algebraic success.

College—College prediction and achievement have been the subject of considerable research. Asher (138) found the partial correlation technic of little value in analyzing educational problems when applied to intelligence and English test results. Whether or not knowledge of intelligence test scores influences an instructor's scholastic grades was investigated by Constance (168), who found a positive influence in one instructor's case. Davis (176) surveyed the intelligence and achievement of 1,400 college students in Kentucky and sought to determine their relationship. The scholarship average of each college approximates a general average regardless of intelligence average. M. A. Gordon (204) found no significant relationship between the student's intelligence and the amount of school work he was carrying. Henry (214) investigated the relationship of aptitude test data to fall quarter grades in ninety-nine cases. Keys and Reed (230) found in comparing summer and regular session students on the American Council Test that the summer group had a larger proportion of superior students, an equal number of inferior students, superiority in the teacher and school administrator group, and superiority in the high-school compared with the elementary-school teachers. The predictive value of the groupings of the Thorndike Intelligence Examination was studied by Lefever (243) who found the best predictive measure for success in the freshman year to be the total Thorndike score.

Masters and Upshall (266) found that normal-school students gained in scores on repeated Thorndike examinations. Results obtained by Messenger (271) indicated that poor students can be eliminated from teachers colleges before entrance by the application of a battery of intelligence and achievement tests. In order of predictive value for success in college mathematics, the most effective technics proved to be the American Council tests, English, chemistry, mathematics tests, according to the report of Perry (292). Roucek (313), experimented with intelligence and knowledge tests applied to students in the Charles University in Prague. Fifty-eight percent of American colleges included in a survey reported a gain in average student intelligence test score during the years 1930-33, according to Thompson (339). Wagner (349) found test scores on Regents examinations more valid than intelligence test scores in predicting the scholastic success of college students. Waits (350) reported a high differential predictive value for the American Council Psychological Examination. Watson (352) used four factors in predicting success of Kentucky University freshmen, namely, high-school scholarship, intelligence test scores, English achievement, and mathematical test achievement scores. In administering mental tests to 1,800 students at the University of London, H. D. J. White (357) found that the ranking in departments from highest to lowest was as follows: arts, science, medicine, librarianship and laws (tied), engineering, journalism, architecture and fine arts. No significant difference was found between the scores of men and women. Students with low scores but good scholarship concentrate better and work longer hours. Those with high scores and poor scholarship records have wider interests, more anxieties, are less healthy. Whitmer (360) proved the value of giving freshmen probationers' assistance and guidance through a comparative study of groups who had and had not received such assistance. Williamson (361) discovered that the intelligence tests were most successful in the prediction of scholastic success of high aptitude freshmen, whereas, high-school percentile rank was more successful in predicting good scholarship of low aptitude freshmen. Wolcott (364) found a correlation of .809 between initial and subsequent Thorndike Intelligence Test scores three and a half years apart.

Professional—The use of intelligence test scores in scholastic prediction for student nurses is reported by several research workers. Bregman (149) obtained intelligence test scores for 10,000 student nurses. They ranked as a group below college freshmen level, but above the high-school norms. More highly selected groups were found in institutions of higher rank. Frankford (195), applying a group test to student nurses entering the training school, found a correlation approximating .80 between these test results and subsequent performance. After two years the number satisfactory in performance who scored originally above the 50th percentile was much larger than those who scored below. Habbe (209) found that the psychological test scores of those student nurses resigning were below those succeeding.

W. B. Jones and Iffert (226) concluded from results of intelligence tests given to 777 prospective student nurses that measures of knowledge and ability can be used to advantage in selection. A test of aptitude for nursing added little to the psychological test. Potts (300) found that the scores of student nurses retained beyond the probationary period were substantially higher than scores of those not retained.

Rhinehart (306) attempted to determine the value of a battery of tests for predicting success in both academic work and practical accomplishment. The American Council Psychological Examination proved of greater value in predicting grades than the Stanford-Binet. A group of student nurses beyond the probationary period proved to be more intelligent than a college group of the same age in a study made by Rosenstein (312).

Triplett (345) found a group of commercial college students to be only slightly below college norms for the American Council Psychological Examination. Ullman (347) found little predictive value in a variety of teacher ability ratings, among them intelligence test scores. R. V. Jordan (228) summarized several studies of teacher and student-teacher intelligence. The data indicated that student teachers as a group rank at the median in terms of college entrance test norms.

Clinical Applications of Intelligence Testing

Delinquents, prisoners, and criminals—Armstrong (135) investigated the parental stock of juvenile delinquents arraigned in a children's court. Twenty-eight percent were of Italian stock, 20 percent Russian, and 12 percent colored. These percents vary from the proportion of these groups in the general population. The delinquent children averaged 77 I.Q. Beane (142) surveyed 300 delinquent girls and analyzed the results with respect to intelligence level, social, economic, and school training factors. Intelligence quotients for incarcerated delinquent boys as reported by Charles (161) have close agreement when results from several tests are compared. Cochran and Steinbach (163) found that the delinquent children do not yield the highest amounts of recidivism. The performance of feeble-minded and delinquent subjects was determined by Knight (237) through the use of performance and verbal intelligence tests. The performance quotients were higher for all groups than the intelligence quotients.

Lane (241) summarized data for delinquents in the St. Charles School. On the Otis Test the median I.Q. was 88.2. On the Binet in 145 cases it was 80.7. McClure (256) found the mean intelligence quotient of 600 juvenile delinquents aged from seven to seventeen to be 79. The average for the boys was slightly higher than for the girls. Rogers and Austin (311) obtained I.Q.'s for over 3,000 juvenile delinquents. A normal distribution curve was found with a mean at 82.2. Retests after several years showed correlations of .63 to .82. Ruggles (314) analyzed the factors contributing to juvenile crime in a group of boys sixteen to twenty-two years

of age sent to a prison farm. The group of boys studied proved to be much below the average in intelligence and mechanical ability. The factor of intelligence deficit is given undue importance among other causative factors of juvenile delinquency in the opinion of Steinbach (331) as the result of investigations in the juvenile courts of Norfolk. R. K. White and Fenton (359) discovered, among other facts in comparing groups of bright and dull delinquents, that forgery was the only offense associated with higher intelligence.

The median intelligence of unmarried mothers was found to be 76 in a study reported by McClure and Goldberg (255) confirming results of an earlier study by them. Growdon (207) reported a mental survey of 2,185 adult female delinquents in the state of Ohio and concluded that for white and negro races and two classes of delinquency, the reformatory prisoners fall below the mental ratings of their respective races in the general population. Mennens (269) reported successful differentiation of prisoners through administering the Healy Completion test. Recidivists and first offenders of average and defective intelligence have equal chances of successful subsequent adjustment, according to Shimberg and Israelite (327) who studied groups of average and defective offenders.

Defectives—Aldrich and Doll (132) compared the development of idiot boys nineteen to thirty-eight months old chronologically with normal infant boys of the same age range on a series of three development scales. The idiots were superior on the performance tests of the Stutsman series, but inferior on the language tests of the Kuhlmann-Binet Series. The same authors (133) studied problem solving in idiots through reaction to tools. Individual differences were found among the experimental group. Arthur (137) reported the same mental classification for the majority of over six hundred feeble-minded inmates of a state school after retesting, with intervals between tests ranging from one to five years. Doll (181) at the request of New Jersey surveyed the status of the feeble-minded in the state. He reported incidence and educational provisions.

Durling (184) reviewed the literature on economic status in relation to I.Q. and studied the employment records of high-grade mental defectives. She concluded that the defective can do work of a routine nature successfully, but only under constant supervision. Fischer (193) used problems in abstraction, definition of concepts, grasping relations, and criticism to diagnose mild degrees of feeble-mindedness in adults. Gordon (205) used the Merrill-Palmer Pre-school Scale successfully with low-grade mental defectives. The normal preschool child has a better command of language than the mental defective of the same age. H. E. Jones (225) differentiated the abilities as shown by tests for adult and juvenile defectives. On the Binet sub-tests groups equivalent in mental age or opportunity showed marked differences.

Murphy (278) analyzed data for nearly seven thousand cases who received mental examinations at the Psychological Clinic of the University of Pennsylvania. Twenty-nine percent were diagnosed as feeble-minded. In

the past five years feeble-minded cases incidence has declined due to a change in the attitude of the public toward the clinic. An experiment with a group test for distinguishing defectives from normals among groups of older school children was reported by Otte (286). Parker (289) investigated the educational proficiency of subnormal children in reading, arithmetic, and spelling as compared with standards for normal children. Portenier (298) found from studying test records in eight cities that the average I.Q. of the high-school population has declined slightly during the past decade and the percent of low mentality pupils who graduate has increased. The low mentality high-school pupils are a selected group with reference to economic and personality factors.

Porteus (299) revised the original maze test series and proved its usefulness in studying the behavior of defectives and delinquents as well as for general examining. Shimberg and Reichenberg (328) questioned the social adjustment of those feeble-minded who never reach an institution. They studied 189 cases. Those who adjusted successfully had slightly better heredity, were from better homes, had more favorable personality traits, were those for whom recommendations made were carried out, and were better supervised. From a study of the mental status of children of mothers who were inmates in an institution for the feeble-minded, Vanuxem (348) found that half of the children tested rated higher than the mothers, and a considerable proportion were equal in status when compared with the mother.

The gifted—Decroly (179) emphasized as the result of research the need for measuring the non-verbal as well as the verbal abilities of gifted children. Burkersrode (157) devised a new series of tests for the selection of talented children in their fourth year of school. The tests were used in conjunction with an observation record. Gifted children, discovered through a battery of intelligence, achievement, and aptitude tests employed in the Iowa high-school survey, were further studied through questionnaires sent to parents. The group were found to come from superior homes, graduate early, and attend college.

A report by Manrique (263) described the use of intelligence tests in selecting gifted children for scholarship grants in Spain. Otto (287) attempted to select by means of tests the more gifted children who should go on to high school. From results of the tests used he drew deductions concerning the nature of intelligence. Moore (277) made a cumulative four-year study of students graduated from high school before sixteen years of age. The students were superior at graduation in intelligence and achievement and maintained their superiority throughout college years. Scheidemann (319) surveyed an opportunity room for gifted children. He found the group to be superior in achievement and intelligence, and less well adjusted emotionally than a comparable group of normal children. Sylvester (334) described in detail five cases of gifted children demonstrated at the University of Pennsylvania. The Harvard growth study, according to Cattell (160) indicated Binet I.Q. increase with age for gifted

children. The earlier Stanford study had shown more decrease. The different results are attributable to selection and difference in ages of the group tested. Hollingworth (219) found that problems of emotional immaturity in children who test above 130 I.Q. observed in high school tend later to disappear.

Other clinical applications—Bronner (150) urged the use of psychological tests in clinical practice in studying unevennesses in abilities. Camp (158) advocated the interpretation of tests in clinical practice in the light of the patient's developmental school and medical history and heredity, and Crane (169) found qualitative examination data as significant as total quantitative test results. The same author (170) showed through a case history the value of thorough testing for diagnostic purposes. Jastak (221) compared responses of normal school children to a variety of test items with responses of children with personality difficulties or behavior disorders. The vocabulary items were least affected by personality disorders. More complex performance test items were more sensitive to mental instability effects. Wires (362) found the reactions of patients in a psychopathic clinic afforded an excellent basis for diagnosis.

Vocational Guidance

Brown (155), discussing the use of intelligence tests in vocational guidance, pointed out difficulties due to overlapping in ability of occupational groups. Pond (297) prepared intelligence score distributions for 9,000 factory men divided into 44 occupational groups. Great overlapping from group to group was found, but averages and range in both test score and schooling correlate better than .74 with an occupational ranking based on estimates of intelligence required for success. Reifenrath (304) found no positive correlation between general and technical or commercial intelligence in several thousand subjects in various vocational groups. Christiaens (162) discovered that intelligence measures using only verbal material were inadequate for vocational guidance. He has found the Decroly Box Test helpful in vocational prognosis. Fryer and Sparling (199) evaluated intelligence testing for vocational success prediction purposes. Farmer (188) found a low correlation between an entrance test and a final proficiency test in skilled trades, but the correlations were raised with the addition of intelligence test ratings. Thorndike and others (340) in a follow-up study of 2,000 children examined at fourteen years of age found low correlations between early test data and subsequent vocational success.

Individual Differences in Intelligence and Mental Development

Anderson and Scheidemann (134) made detailed reports of three sets of triplets, including developmental history, mental and personality test results. Finch (191) obtained for 1,023 pairs of siblings a correlation of .49. Outhit (288) comparing the intelligence ratings of siblings with each

other and parents with their children found correlations of .42 to .72 between first-second and first-third sibling. Between mid-parent and mid-child, correlations of .77 to .80 were found, and between single parent and single child, .40 to .68. H. D. J. White (357) compared the intelligence ratings of twenty-six pairs of twins and obtained correlations of .82 using the Binet test, and .92 using the Kuhlmann.

Sex differences have been determined by several investigators. Book (145) found among university students that men excelled on maze and block counting tests, and the women on number checking and pattern recognition. Employing the Goodenough Drawing Test method De Oliveira (180) observed that up to the age of nine the girls are superior, after this the boys achieve the higher mean score. Conrad, H. E. Jones, and Hsiao (167) analyzed army test results for sex differences in groups of children and adults in a rural community and found the females superior to the males. The superiority varied with sub-tests.

F. N. Freeman (196), studying individual differences in mental growth, found that slower growth children do not necessarily reach the end of their mental growth period earlier than do the faster growth children.

F. S. Freeman (197) summarized findings on the extent of individual differences, influence of environment, race and nationality, differences due to sex, factors of age, physical development, and personality.

Marked correspondence in occupational level of parents and their children characterized the data obtained from the cross section of a typical school population by Hildreth (217). A. M. Jordan (227) studied the influence of parental occupation on test scores for over 1,200 school children in grades one to seven. Substantial differences in mean test-scores for various occupations were found. In the genius group appear only children of professional workers. The median score increases with improvement in economic level.

Davidson (175) conducted an experiment in which bright, average, and dull children all at the four-year mental level were given practice in reading. The bright group proved to be noticeably superior, the dull noticeably inferior in reacting to the experimental material. Driscoll (183) compared the reliability of Merrill-Palmer and Kuhlmann materials in predicting future development of young children. Prognosis was more accurate from the preschool composite rating than from the I.Q. alone. A statistical summary made by Loudon (248) proved the superiority of the bright children over the dull children in Stanford-Binet vocabulary response.

In a large adult population Grace (206) found no relation between age and mental ability. H. E. Jones and Conrad (223) in studying growth and decline of intelligence in a group ranging in age from ten to sixty, found a decline by age fifty-five amounting to recession to the fourteen-year level. Miles (273) summarized the results of the Stanford Later Maturity Study. Declines were universal in all traits tested with advance in age, but decline is less rapid in some traits than in others. The same author (272) con-

structed ability-at-age curves for ages ten to eighty-nine for sensory acuity and mental traits, and found that maximum ability in a wide range of functions occurs between eighteen and forty-nine. Decline is not precipitous but progressive. Shacter (325) investigated the relation between sustained attention in school children and I.Q. Correlations were not of any appreciable size.

Harter (210) investigated individual differences in 247 men and women subjects with digit-letter substitution tests. Individual differences due to practice persisted throughout the learning. Perl (291), using a series of mental, vocabulary, and arithmetic tests with fourth-grade school children, found increases in individual differences in three out of four tests and decreases in one test. Increases occurred in complex processes; decreases occurred in the simpler processes. Shultz (329) gave five symbol learning tests to college and technical school students a week apart, and found that the individuals varied quantitatively and qualitatively in performance according to the normal distribution curve.

Relation of Intelligence to Other Traits

Intelligence and physical status—M. E. Broom (153) found a very low positive correlation to exist between cranial capacity and scores on intelligence tests among college men and women. Low positive correlations were found to exist between physical and mental age and physical and mental quotient in institutionalized feeble-minded boys, in a study made by Davenport and Minogue (174). Dawson and Conn (177) attempted to determine whether any relationship existed between disease condition and Binet test results in hospitalized children. Some illnesses are followed by more mental deterioration than others. Guilmartin (208) summarized the use of psychological tests with deaf children. Subjects of superior intelligence as rated by standard tests showed greater physical development on the average than those in a subnormal group reported by Lucena and Barreto (252).

Maller (260) obtained data for 310 health areas in New York City with reference to vital statistics, juvenile delinquency, school progress and intelligence. He found a marked degree of intercorrelation in all factors studied. Marked national differences were found in each measure. Merry and Merry (270) employed with good success the finger test as a supplementary test of intelligence for blind children.

Nilson (282) studied the intelligence test results of physically disabled children among an unselected school population. Results for the disabled children compared very favorably with those for the physically normal children. Patrick and Rowles (290) found negligible relationships between physiological measures, vital indexes, intelligence, personality rating, age, and point-hour ratio among fifty-two university women. A narrow age range may have affected the relationships found. Richey (309) paired children with and without diseased tonsil or adenoid condition and found

only small, unreliable changes due to continued diseased condition or its removal. No relationship was discovered to exist between measures of intelligence and physical condition by Schell (320) in a comparative study of siblings, one of whom had a diseased condition, the other not. Wellman (354) summarized studies reporting the relationship between physical maturation and mental maturity. No relationship was found to exist between some measures of physiological maturity and mental development.

Intelligence and environmental conditions—Armstrong (136) compared groups of urban and rural children with the Otis Intermediate Test and two performance tests. The rural group was superior in verbal and abstract intelligence to the foreign-parentage urban group. Children in either group, if of American parentage, of equivalent occupational class, and of equal educational opportunity, were similar in the abilities measured. Although it is impossible to predict intelligence or scholarship from socio-economic status, according to the conclusions of Cuff (172) an association was shown in college groups measured with the American Council Psychological Examination between the test results and rating of socio-economic status. Figuerido (190) discovered considerable influence of the social environment on test results in administering the Dounaievsky test to university level students.

F. N. Freeman (196) concluded from studies of duplicate twins reared apart compared with those reared together that the former differed from each other in ability about twice as much as the latter. He found no evidence that slower children reach their mental growth earlier than faster children. Newman (280) reported a series of pairs of identical twins reared apart from infancy. The contrast in environment of the various pairs differed as did also the scores in mental and educational tests. Hicks and Ralph (215) practiced a group of nursery age children in tracing the Porteus maze with both preferred and non-preferred hand. The practice did not result in significantly greater skill.

H. E. Jones, Conrad, and Blanchard (222) found, in comparing test results of rural and urban children, that the rural environment was a handicap. They concluded that a rural child moving to the city would increase his intelligence test scores merely as a result of changed environmental conditions. H. E. Jones (224) summarized studies of birth order and intelligence. He concluded that results were conflicting and that therefore the findings were negative. Such studies are liable to error because of the many factors that must be controlled. Kavin and Hoefer (229) measured with Merrill-Palmer Tests two- and three-year-old children who attended nursery school and those who did not. No differences were found between children who had and had not attended nursery school. Kiriara (233) analyzed the results of intelligence tests for children coming from different social levels. He concluded that the relatively poor showing of children of the laboring classes was due both to inheritance and milieu. Liberman and Elperine (244) concluded from an analysis of test results that many tests give an undue advantage to urban subjects. From compar-

ing initial and retest I.Q.'s of orphan-asylum children Lithauer and Klineberg (245) concluded that improvement in environment apparently has a favorable influence on the I.Q. Luria (254) studied the verbal reactions of children from different environments and concluded that these reactions can be evaluated only in terms of environmental opportunity. Maller and Zubin (259) studied the effect of rivalry motivation in test achievement. Although no increase in score was found, more items were attempted, errors increased, and greater variability in score resulted. In a study reported by Pintner (293), children from non-English speaking homes made better scores on primary non-language tests than on primary tests requiring comprehension of verbal directions.

Pintner and Forlano (294) distributed over 17,000 I.Q.'s according to birth-month and found the lowest I.Q. level for each social group to fall in the months from January to March. Senour (324) concluded from a study of intelligence test results for children from foreign homes that verbal tests rate the children lower than non-verbal tests. He recommended the use of the non-verbal in preference to the verbal test.

Sherman and Key (326) measured the intelligence of isolated mountain children and concluded that the children develop according to the demands of their environment. Intelligence was highest in communities of higher social development. Wheeler (356) concluded from the results of testing Tennessee mountain children that environmental factors materially affected the results.

Syrkin (336) found superior test scores for children of Soviet officials as compared with children of workers. Even when vocabulary differences are eliminated the superiority of one group over the other remains.

Schwesinger (321) summarized all recent material on genetic and environmental factors as they affect the development of intelligence. Techniques for the measurement of intelligence and personality are described.

Snedden (330), repeating the same and different forms of the same test, found greater practice effect in repeating the same form of the test. An entirely different test resulted in still less practice effect.

Intelligence and other traits—Attenborough and Farber (139) investigated the "G" factor among mechanical ability, intelligence, and manual dexterity tests administered to school children. Correct judgment of intelligence from penmanship occurs only by chance, according to B. H. Broom and Basinger (151) who compared centile placement of adults in penmanship and intelligence. Carroll (159) obtained positive correlations between intelligence and literary judgment as the result of administering a prose appreciation test and intelligence tests to high-school students.

Dawson (178) concluded that the less intelligent population groups are increasing at a rate greater than the more intelligent and might in time greatly outnumber them.

Durrell (185) observed that the results of group tests varied with the amount of reading required and concluded that group tests containing a large amount of reading material should not be used for the computation

of intelligence or accomplishment quotients. Goodenough (203) reported that a fairly close relationship existed between drawing progress and general intellectual development. Hartge (211) determined the intelligence of high-school girls by three methods: intelligence tests, teachers ratings, graphology. There was 56 percent agreement among all three methods. Hildreth (217) concluded as the result of administering verbal and non-verbal tests to young bright children that these subjects were equally competent in both types of tests.

Jagers (220) compared the intelligence of 47 problem children and 48 well-adjusted children above the fourth grade. On three tests the median I.Q. of the well-adjusted groups was 112; for the problem children, 96.

Koester (238) investigated the interrelations of intellectual aptitudes, and talents for music, drawing, and technical skills. He concluded that in passing from the superior intellectual groups to the less intelligent groups the percent of subjects possessing a very definite special talent decreases, and those judged mediocre increase. Loomis and Moran (247) discovered that the use of "a," "an," "and," and "the," in written composition correlated more highly with mental age than any other part of speech. Children studied by Lowry (251) who were given three months' intensive training in reading increased their I.Q.'s on a second intelligence test following the training period, compared with a test given before the training period, to the extent of 11.76 points. Matheson (267) compared the intelligence ratings of preschool children with response to problem-solving situations of the Kohler type and found positive correlations with mental and chronological age. Monnin (274) computed correlations between intelligence and arithmetic from tests given to school children. Moore (276) concluded that the distinction between "linguistic and non-linguistic" is not exact. Although the functions are distinct, they may be measured in a single test, either linguistic or non-linguistic. Morison (275) reported that the speech habit, echolalia, was never observed in any but the mentally defective. Rust (316) studied resistance to tests in young children and found negative correlation between resistance and intelligence quotient, positive relationship between resistance score and difficulty of the test. Taylor (337) found a high positive correlation between visual apprehension and mental and chronological age in child subjects who were shown a number of toys. Tinker (343) observed that speed of response is associated with mental and scholastic test responses when speed and ability were measured on the same kind of material.

Racial characteristics and intelligence—The intelligence and mental development of negro subjects has been reported in several publications. A selected bibliography on the physical and mental abilities of the American negro has been prepared (323).

Beckham (143) summarized the results of Stanford-Binet tests given to 1,100 school children and found variations between test results and school grade, age, occupation of parents, family size. There was little correspondence between vocational aspirations and ability. Bousfield (146) measured

the ability and achievement of negro school children in Chicago. The subjects rated normal on the non-language test, below norms on other tests.

Klineberg (235, 236) concluded that cultural and environmental factors have an important bearing on intelligence test responses. Colored children were found by Long (246) to be on the average 4.76 points below the average white child in intelligence quotient, but this difference he attributed to environmental factors.

Nissen, Machover, and Kinder (283) used performance tests in evaluating the mentality of native African negro children five to fourteen years of age in the area supplied by the American slave trade. The tested subjects were inferior to the norms for the tests. Results were more favorable in the tests less related to civilized content. Pintner (295) investigated intelligence differences between negroes and whites. The intelligence of negroes appeared to be lower than that of the whites. Price (302) reviewed the literature on the problem of negro-white differences in intelligence and concluded that there has been no comprehensive measurement of negro intelligence, no valid comparison with whites.

Stowell (333) in a comparison of white and negro institutionalized feeble-minded children found the negroes to be younger and mentally superior to the whites.

Thurmond (341) compared the intelligence and achievement of twelve-year-old negro children in a rural district of Georgia. The children proved to be retarded on the Arthur Performance, Stanford, and Illinois Tests to the extent of two or more years. Using the Arthur scores as a criterion, they were retarded one and a half years in spelling, three years in handwriting. Using Stanford M.A. as a criterion, the retardation is less serious.

Mexican children tested by Manuel and Hughes (264) proved to be equal to other children, grade for grade, in intelligence and drawing. Manuel (265) concluded that the Mexican child ranks below the average school child in Texas both in intelligence and school record. The inferior test ranking of Spanish-speaking children is not as Sanchez (317) concluded, peculiar to Spanish-speaking children generally. The same author (318) found gains in all abilities tested in a group of Spanish-speaking children in New Mexico, and urged consideration of testing conditions in making racial comparisons.

Collmann (165) compared the Otis Test scores of children of Victoria, Australia, with the norms and found no significant difference between these children and those on whom the tests were standardized. Oliver (284) made adaptations of test materials for measuring the mentality of Africans. Because of limited educational opportunities in the groups tested, little use was made of school knowledge materials. The same author (285) compared the abilities of English, French, and native subjects in their respective colonies.

Several investigators reported studies of Jewish mentality. Maller (261) reported data concerning the intelligence of young Jews. Roback (310) reviewed the literature on the measurement of Jewish mentality and at-

tempted to explain Jewish superiority. Another summary on the same topic was made by Rumyanek (315).

In measuring groups of part-Hawaiians with the Binet, Porteus Maze, and Healy Picture Completion Tests, Louttit (250) found children of Hawaiian-white-Chinese mixtures superior to other groups. Fourteen years appeared to be the upper limit of mental development in these groups. Eells (186) found the average I.Q. on the Stanford-Binet tests for Eskimo, Aleut, and Indian children to be respectively 73.67, 80.27, and 78.88, and on the Goodenough Drawing Scale 89.56, 93.29, and 91.55. I.Q. appeared to increase with greater admixture of white blood. Garth (201), who employed a carefully controlled technic in studying the intelligence and achievement of mixed blood Indian children, concluded that mixed-blood bears only a slight relationship to intelligence. Telford (338) compared Goodenough test performance of Indian, white, and negro children. The average I.Q. of the Indians was 88; of the whites, 100; and the negroes, 77-79. Indians proved superior to whites on the mare and foal test. No significant correlation was found between performance and amount of Indian blood. Luh and Wu (253) found Chinese children in Peiping to be equivalent to American children in performance test achievement.

Barke (141) used non-language and verbal mental tests in comparing children aged ten to fourteen in three bilingual schools in a Welsh-speaking mining district with children in monoglot schools in an English-speaking district. Children in the bilingual schools appeared to be slightly superior.

Reichard (303) found differences in Slav and Jewish immigrants of both subjects associated with schooling, sex, and age. No racial difference was observed. As the result of non-language tests administered to immigrants, Kolb (239) ranked racial groups in order of superiority as follows: Norwegian, English, Swedish, German, Irish, and Italian. The differences ranged in terms of test age from 1.5 to 6.5 years depending upon the test.

Haven (212) obtained a higher intelligence quotient, but a lower achievement quotient for native-born as compared with foreign-born children when tested with the Otis Classification Tests (form fourth to eighth grade). No significant racial differences were found by Louttit (249), in comparing students of white, Japanese, Chinese, and Hawaiian ancestry in Hawaii on tests of immediate recall. Daniel (173) criticized existing studies of racial differences and proposed a list of sixteen criteria which must be met to make racial difference studies valid. Lambeth and Lanier (240) studied speed of reaction in groups of negro and white twelve-year-old boys and concluded that the more complex the test the higher the relative score of the whites. Nassri (279) applied the Pintner-Paterson scale to French school children and concluded that national differences in comparing the subjects studied with American subjects can be demonstrated.

CHAPTER III

Measures of Aptitude

TO THE ACCOMPANIMENT of much healthy self-criticism the development of aptitude tests has gone on apace during the past three years. The literature for the period contains over two hundred titles on aptitude tests for many lines of endeavor—advertising designers, engineering apprentices, book revisers, dentists, dressmakers, executives, modistes, policemen, salesmen, shoemakers, surveyors, teachers, weavers, and others. The largest number is reported in the German journals, followed by those of the United States and England. Also represented are France, Italy, Russia, Spain, Australia, Argentina, and Japan.

The line between aptitude and achievement tests is always a thinly drawn one. Sections of many of the tests mentioned above are out-and-out trade tests. A general characteristic is the absence of published validity coefficients. In an aptitude test this lack is far more serious than the general lack of published reliability coefficients, shown by Woody (478) to be characteristic of most published tests. Reliability can be had cheaply, usually, by simply lengthening a test. Validity responds but little to lengthening.

Some articles report impressive validities based upon less than twenty cases. Rare indeed is the study which tells of an aptitude test having been validated upon some group other than the experimental group employed to determine the selection, weighting, or scaling of tests and items. Apparently most aptitude tests die aborning.

Common Misconceptions

A number of common fallacies to be guarded against have been pointed out by Crawford (385), Kitson (418), Kingsbury (416), Hoppock (408), and others. These are as follows:

1. One should not take for granted that a test with a certain published reliability and validity will have the same reliability and validity when administered to all other groups.

2. One should not assume that the regression of all traits upon success is linear. For example, groups of exceedingly conventional or exceedingly conservative artists may both succeed excellently, while the intervening group may find its product unsaleable. An occupational trait profile constructed from a population of all artists or made up only of individuals from the two extremes is meaningless.

3. It does not follow that the resemblance of an individual's profile to the occupational trait profile of the average man in the occupation or even of the 75th percentile man, or better, in the occupation, is an indication of success in the occupation unless the traits making up the profile are those which, in combination, are highly valid in predicting differential success in that occupation. This is a caution against the hasty adoption of the *ape-the-successful-man* type of psychology.

4. There is no indication of validity, as assumed by some, in the fact that a graph of the first quartile points and of the third quartile points parallels a graph of the median points on a series of tests arranged in a sequential order as in profiles.

5. Consistent status on two or more highly interrelated (alternate forms of) tests or functions (labelled "mechanical ability," "social intelligence," etc.) is no evidence in itself of validity even if plotted in a profile. Alternate forms of tests or tests highly intercorrelated will yield essentially identical normated scores even though the validity of the tests in common is approximately zero.

6. The drafting of a profile does not in itself imply validity. All tests yielding distributions, *ipso facto*, have norms; therefore they may be included in profiles. But of what avail to be tenth decile rather than first in a test of zero validity!

7. It is a fallacy that "anyone can be trained to do anything equally well."

8. It is a fallacy that "there is a certain niche in the economic system for which each person is designed by nature, if he can only find it."

The Inadequacy of First Degree Regression Equations

Johnson (410) pointed out a fundamental weakness of aptitude testing as generally practiced today, namely, that the measures now generally used are strictly additive, no provision being made for the possibility that the absence of any one trait or characteristic may mean failure in a given field of endeavor regardless of the presence of many other favorable characteristics. Kelley (415) and Toops (462) described the use of higher degree equations, involving multiplicative scores for dealing, among other things, with this situation (see Chapter IV).

Another method for meeting the situation more adequately is through prediction from "patterns" of characteristics. Large scale statewide testing programs, for example, are bound to secure fairly large groups of people who are "alike," and studies based on such like-patterned groups should yield pertinent data as to the potency of different patterns in predicting various criteria of success. Projects now under way in which such studies are eventuating or may be expected to eventuate are the statewide intelligence testing and achievement testing programs of Alabama, Colorado, Georgia, Indiana, Iowa, Kentucky, Minnesota, Mississippi, North Carolina, Ohio, Oklahoma, Wisconsin, and Wyoming; and the extensive occupational testing and employment stabilization projects of Minneapolis (455), Rochester (409), and Cincinnati. The study of patterns will be greatly facilitated by a recently discovered method of identifying and coding profiles (468). Graphic treatment of patterns has been described recently by Trabue (469, 470), Dvorak (394), and Segel (449, 450).

Need of a Standard Group for Reporting Validity and Reliability

Validity and reliability coefficients obtained from different groups simply are not comparable. The field of vital statistics was in a similar predicament until the "standard million" concept was brought into use. Death rates in Arizona and Massachusetts are not comparable until the effects of different age and sex distributions are ironed out. Reports on the reliabilities and validities of tests will continue to be relatively unintelligible to the prospective user until a similar standardization is successful.

Need for Interpreting Scores in Relation to the Individual's Stage of Development

The influence of time in the development of aptitude has largely been ignored. All tests yield cross-section views of ability. Yet seldom are a number of successive testings assembled into an individual "growth curve," a special case of the profile in which a single test function with successive retests is graphed instead of tests of additional functions. The state of scientific advancement at the present is characterized best perhaps by the statement that the resources of a Croesus probably could not at the present moment locate the growth curves of height of twenty individuals measured annually from birth to the age of twenty-one. Courtis (382) stated that an excellent I.Q. can be determined for an individual by a consideration of the rate at which he erupts his teeth. He (381) also pointed out that a single test is uninterpretable unless the conditions of motivation are known and are uniform for the group. The work of this research worker is deserving of more attention from scientists, educators, and test-builders than it has had. The inauguration of cumulative records alone does not necessarily insure the accumulation of even the basic data for such investigations. The units employed must be equivalent over the range of growth; the intervals between measurements preferably should be arithmetical and uniform for all; the reliability of the measuring instruments and of the measuring methods must be high; and the conditions of motivation of the subjects must be controlled and be expressed in definite (verifiable) categories. Considerable effort has been made recently to measure periodically, interview, and follow up individuals over a period of years. Noteworthy researches of this type are Terman's studies of genius (377); the Pennsylvania study of the Carnegie Foundation (379); the annual tests of children by Dearborn (401) and the Brush Foundation (461); and the follow-up of 2,000 children over ten years by Thorndike (460).

What Should Be the Criteria of Aptitude Tests?

Just what criterion an aptitude test should predict has never been settled to the satisfaction of discriminating investigators. "Success" is a handy word with which a fight may be started in any camp. Is success a matter of remuneration and job level or of one's suitability for the job as judged by self and employer? Thorndike (459, 460) has chosen one set of measures; the investigators of the London (395) and Birmingham (368) experiments have chosen another. Macrae (423) has pertinently observed: "The truth is that the estimation of actual success is almost as difficult as the estimation of potential success."

Admittedly, grades are a sorry measure of the success with which an individual meets the college situation. Yet these have been used universally as criteria for lack of anything better. Grades are a hodge-podge of many characteristics of the individual, the instructor, the course or courses taken, and the situation.

That average grades for different individuals are comparable is a dubious assumption in the light of the variation in the difficulty of courses (402, 476). As Kitson (419) has pointed out, identical averages may represent vastly different performances. A given average for one person may represent fairly uniform achievement in all subjects taken; for another, the same average may represent high marks in some courses and low marks in others.

Tyler (471, 472) and his associates have been making rapid progress in the matter of measuring educational achievement by defining objectives in terms of specific observable behavior and developing efficient methods for their measurement. The question of the proper combination, if any, of these measures still remains a problem.

Attack on the problem of making ratings more reliable has been made successfully by the American Council on Education, as reported by Bradshaw (375), by Stevens and Wonderlie (454), and Richardson and Kuder (445). The trend appears toward specifics, using statements and phrases such as would naturally come from the tongue of the raters. The last-named study applied the Thurstone scaling technic of equal-appearing intervals in the development of a list of statements which are marked as being true or not true of the individual rated.

Evaluations of Test Programs

Evaluations of the results of four aptitude testing programs over a period of years have appeared. In one of these, reported by Thorndike, no vocational counseling took place. In the other three, vocational counseling was given to the subjects on the basis of tests, school records, and interviews.

Thorndike and his associates (460), in an extensive follow-up study of children, undertook to find out how well school records up to the age of fourteen and test scores at the age of fourteen would predict future educational and industrial careers. They concluded from their data that, in general, school grades reached, scholarship marks, intelligence test scores, or any combination of these, predict later success in school fairly well, but that little can be predicted, by means of the tests employed, as to vocational success to be achieved by the age of twenty-two. The reservation is made that such prediction may be better for a later age when the superior individuals are out of school and well along in their careers. Of note is the observation that there is much indirect evidence that employers do not fit wages to services very accurately in the case of these young workers, and that there is direct evidence that they pay substantial premiums for mere size in the case of clerical workers. The conclusion is reached that "even if the correlations with services rendered should be as low as those with wages received (they probably will be much higher), test scores will be much better than prejudices and superstitions." The findings of this inquiry have raised a storm of heated criticisms on a number of counts (436, 423), chiefly on the point that the experiment cannot be taken as a test of the possibilities of vocational guidance since no attempt at guidance was included in the research program.

A second follow-up study of children who had been given vocational advice at the London Institute of Industrial Psychology was reported by Macrae (424). The earlier and more extensive follow-up by the London Institute was reported in 1931 by Earle and others (395). The later study discovered 79 percent of the guidance predictions to be "correct" for the group of nearly 200 subjects. Any prediction was classified as "correct" if a guidee who succeeded had followed the Institute's advice and if a guidee who failed had rejected it.

A similar follow-up of individuals who had been given vocational guidance by the Australian Institute of Industrial Psychology was reported by Mirk (427). It was found that 86.6 percent of the subjects had acted in accordance with the advice given. Of these, 92.3 percent considered themselves wholly satisfied, 5.1 percent partially satisfied, and 2.6 percent wholly dissatisfied with their work. Of the subjects who had not acted in accordance with the advice, 8.3 percent reported they were satisfied, 25 percent partially satisfied, and 66.6 percent dissatisfied with their work.

A control group of children who received advice based on interviews only was used by Allen and Smith (368) and Allen (369) to check the results obtained from an experimental group of children who were given counseling with the aid of psychological tests upon leaving school. The findings indicate more satisfactory results from the use of tests in guidance than from guidance without the use of tests (control group). Thorndike has suggested that the favorable results obtained are due to the fact that employers and children were "influenced" in their ratings of suitability by the recommendations and whatever discussion accompanied them. To this Macrae (423) retorted that there was an equal opportunity for similar discussions with members of the control group.

Statewide Cooperative Testing Programs

Statewide testing programs have developed in a number of states as reported by Segel (451) and Proffitt (444). Such programs are directed toward measuring the achievements and capacities of students in order that they may be helped to the most effective development and participation in today's complex society, and are, in a very real sense, directed toward evaluating individual aptitudes.

In addition to directing attention to the importance of individual differences and having measures of them for consideration in the choice of courses and vocations, these programs are intended, among other things, to carry new objectives of education to the schools; to put scholarship on a par with athletics as to attractiveness; and to locate promising students for purposes of college recruiting. Minnesota and Ohio are seeing in the intelligence scores gathered a means of transmuting high-school marks to a common basis by the system hereinafter described, and for obtaining for prognostic purposes "character quality" inherent in high-school marks. A student of low intelligence must be a consistently hard worker in order

to make good grades over a four-year period, while an intelligent student with consistently low grades may probably be classed as lacking in academic interest and drive.

A minimal guidance program as outlined for the state of Ohio has been described by Toops (463, 466). Particularly noteworthy in the Ohio program is the use of a guidance manual, *Opportunities in Ohio Colleges*, which places in the hands of the high-school student information, secured by a uniform questionnaire outline, about the specific colleges of the state. Included is a device by which the student rates the several colleges which he is considering on a number of specifics, the relative importance of which was decided by a vote of presidents of Ohio colleges.

While statewide programs have as yet given little attention to the objective evaluation of personality characteristics, such a development is needed. The Ohio College Association is at present considering a social participation inquiry partially to meet the need. It is proposed to make a survey of students in a large number of Ohio colleges in order to determine what strengths, deficiencies, aims, and purposes are associated with participation or non-participation in extracurriculum activities and to determine the pattern of traits that identify those individuals who need (a) personality development through extracurriculum activities and (b) curbing of extracurriculum activities in the interest of a well-rounded personality program.

Noteworthy points in reports of statewide testing programs are as follows:

In Wisconsin, the issue of freeing the public schools from the pattern of prescribed entrance units has been raised since the tests are so much the better pronosticators of college success than the patterns of subjects studied (405, 407).

It has been pointed out in Ohio that the colleges of the state could be recruited twice over from students above the 40th percentile in the distribution of intelligence scores of Ohio College Association freshmen, and thus the need for thousands of scholarships is squarely raised (465).

The Pennsylvania study points out that forgetting is an important phenomenon of college learning, seniors often knowing less than freshmen in a given topic, and that the products of colleges are no more uniform than the products of the secondary schools, thus implying the need for transmuting the marks of the colleges as well as of the high schools (379).

In Minnesota, a simple transmutation of averaged high-school marks has been shown to be of as much value as intelligence tests for predicting college success, thus suggesting this as a function which should be performed annually in all states (411).

All in all, the statewide testing movement bids fair to lead to a new kind of educational statesmanship in which the total talents and attainments of state populations shall be as carefully considered by a state's guidance director as are those of the citizenry of nations in time of war. When such shall have been done, it is inevitable that consideration be given to the contention of Clark (380) to the effect that the present economic dilemma, and its increasing complexity whenever the growth of population shall have

stopped, can be solved only by a national occupational planning board. This board would have as one of its chief jobs the creation of thousands of new occupations—mainly service occupations—and which will subside preparation for and entry thereupon.

Scholastic Aptitude

Wagner (475) made a general survey of the literature on college scholastic prediction. Some of the variables which have been studied are discussed below.

High-school grades—Investigators are generally agreed that better prediction of college achievement, theoretically, may be obtained from high-school marks than from intelligence tests, and, in fact, several studies have obtained the highest correlation from them. Among these studies are those of Crawford (384), Douglass (392), Edds and McCall (396), and Schleier and Schreiber (447). This is exploiting the reliability of marks at different ages, and so, presumably, as the reliability of marks in both schools is improved, the limit will approach the corrected-for-attenuation coefficient, whose limit presumably is 1.00 when the curriculums of the two schools are identical but couched at different levels of maturity.

Such use of high-school marks in a given college, where the students come from many high schools, generally implies the transmutation of marks to a common basis. Toops (467) has pointed out that "the two most important reasons why marks are non-comparable, we may guess, are that (a) the distributions of marks are not identical and (b) the intelligence distributions of the pupils may not be equal, even if the former condition obtains." He has therefore proposed the principle that the average marks of all pupils of a given narrow range of intelligence, in whatever high school, shall be transmuted to a common transmuted score. "If one of these schools, say A, be designated as a standard school (it may be a hypothetical school) the marks of all other schools may be transmuted to the basis of the standard school. Thus all marks of all pupils in all schools, having been made comparable with the marks in school A, will be comparable with one another. And, accordingly, it follows, for example, that a college may be built up (compounded) of the past populations of many schools with known (equated) secondary-school success; and these secondary-school transmuted marks confidently may be expected to prognosticate college success very much better than will the untransmuted marks, or the transmuted marks arrived at by any system which ignores the intellectual differences of different schools.

"Eventually the question would arise: 'Should the school be rated on all subjects, or should the "non-intellectual" ones, like manual training, shop, art, and domestic science, be excluded from the averages?' It will be a progressive move when the pupil's transmuted secondary record which goes collegeward is not a 'rank of 5 in a class of 63,' nor even a single transmuted score as described, but instead *several* (italics ours) transmuted

scores, saying, in effect, 'On a comparable standard, this pupil is good in science, mediocre in mathematics, and excellent in English.' " Evaluation of patterns of high-school credits and transmuted marks by the process already described would then be in order. Probable success in specific curriculums should be the aim of prediction for the purpose of giving more specific educational guidance than is now feasible or wise, for it is in this realm as observed by Link (420), that the most promise for guidance lies.

Intelligence tests—Many correlations of intelligence tests with college scholarship are reported in the literature. In recent years, most of the correlations in representative studies range from .50 to .65 (378, 387, 434, 464, 474).

Colleges and universities today are being called on much more frequently by business, industry, and school for the intelligence records of university students. If high-school and university scholarship were transmuted to a comparable basis as described above, employers would find these of as much interest as the intelligence tests. One reason for this present interest in the latter is that the use of percentiles in interpreting scores makes them quickly understood by the layman. Another reason is the predominant use of a certain half dozen outstanding intelligence tests.

The early fears of some that the centralized control of test programs would lead to lack of progress would seem to be realized if we judge by the increase in the validity coefficients alone. But the situation appears better on second inspection. After all, the making of better tests is a technical matter, necessitating funds, machinery, and time for the careful item analysis which is required. There is some likelihood that the lack of improvement in validities during the depression is a function of the upward swing in average intelligence of entering college students (458). Since the range of intelligence has decreased, it has required better tests to maintain the old validities.

Another explanation for the rising average intelligence score, less plausible to the writers, is that higher scores are being obtained because presentday students have been "test-broken" through their previous school experiences with objective tests. Many contend that the college students of today are much more serious-minded than those of a half dozen years ago. An interesting corollary of higher selection as to intellect and purpose, is that, with no change in scholastic standards, failing (i.e., D and E) marks should seldom if ever be given.

A notable application of intelligence tests at the university level is that of standardizing the marking system of individual college professors as described by Ogan (433). The individual intelligence scores and marks of his students in other courses are used to help the instructor to determine whether or not his grading standard is relatively low or high. Whinery (476) has also used intelligence scores as the basis for determining the relative difficulty of courses and for making comparable the marks from course to course.

Achievement tests—Validities comparable to those obtained from intelligence tests have been reported from various subjectmatter tests such as the Iowa Content Examination (473), the Kentucky Classification Test (434), and the College Entrance Examination Board's test (376).

Study time—Although May (425) found, several years ago, a distinct relationship between degree of application as measured by reported study time and scholarship, later studies have failed to confirm this finding. Hartson (402), for instance, found a correlation of $-.15$ between estimated hours of study and grades. L. Jones and Ruch (412) reported one of $-.28$. In both studies the improvement in prediction is negligible when this measure is combined with intelligence scores. One reason for this lack of relationship is that students do not estimate their study time correctly. As revealed by Stokes and Lehman (456), the poorer students tend to overestimate their time more than do the better students. The less able students, on the whole, compensate somewhat by studying more and, possibly, by electing a larger proportion of easier subjects.

Personal data—With few exceptions, personal data have proved to be of little use in prognosticating college achievement (372, 457). Age at entering college, however, has generally been found to have a significant negative correlation with college grades (384). Age, however, is simply crudely reflected intellect.

Personality characteristics—A field of investigation in the college area which is demanding attention is that of the more adequate measurement of attitudes, interests, and motives. A few scattered studies have been made for the purpose of predicting college grades. Hartson (403) found that a blank for recording student interests had validities of $.365$ and $.231$ for men and women respectively. Holcomb and Laslett (406) found a validity of $.322$ in predicting the grades of freshman engineers from engineering scores on the Strong Interest Blank. Segel and Brintle (452) reported a marked relationship existing between vocational interest scores on the Strong Interest Blank and differences between marks in college subject groups, as well as differences between achievement test results on the Iowa High School Content Examination. Scores on such blanks have been found to be easily faked, making them of value only in case the answers are bona fide. Investigators have found that interest and attitude scales validated on one group frequently lose most of that validity when given to other groups (393). The American Council on Education record system calls for a careful cumulative record of specific interests. However, such records, desirable as far as they go, do not readily admit of any but subjective interpretation, although the trail has been blazed by Bradshaw (374), who showed several years ago that "behavior specifics" are of far more value in character measurement than the scores derived from any character rating blank or scheme.

Combinations of various measures—The multiple correlation coefficients based upon the best combination of a number of prognostic measures were reported by Wagner (473) to be $.67$ for the investigations reviewed. Craw-

ford (384) reported validity ranging from .68 to .74 based on a combination of transmuted high-school scholarship, College Entrance Examination Board averages, scholastic aptitude test scores, and age at entrance. Hartson (403) obtained a validity of .68 from the use of five tests. Byrns (378), Edds and McCall (396), and Douglass (392) reported multiple correlations of .63, .81, and .64, respectively. These are encouraging when viewed in the light of the .35 and .40 which typified the validity of Army Alpha some fifteen years ago.

Scholastic Aptitude in Specific Fields

The reader is referred to Wagner's review (475) for studies on the prediction of achievement in specific subjects. Wagner's own work (474) along this line is notable.

Prediction in various curriculums is taken up below:

Dentistry—Schultz (448) investigated the relationship of performance on the Miles Two-Story Duplicate Maze and on the American Council Psychological Examination to the success of 90 second-year dental students in their courses as measured by eight different criteria. A score of maze adaptability produced the highest validities, the correlations being from .247 to .372 with the various criteria. Keller and Weber (414) reported on a battery of tests which all persons seeking to prepare for the dental profession in Germany must take.

Engineering—Of the tests which Holcomb and Laslett (406) tried out, the highest validity in predicting grades of first-year engineering students was found to be that of the American Council Psychological Examination with a correlation of .555. Other correlations were as follows: McQuarrie Mechanical Aptitude Test, .478; the A-S Reaction Study, -.41; Stenquist Mechanical Aptitude Test No. 2, .428; and engineering scores on the Strong Interest Blank, .322. No combination of the scores of the different tests was attempted. Grades in freshman mathematics and freshman mechanical drawing courses were found by Wilson and Hodges (477) to correlate .42 and .406, respectively, with grades in advanced engineering courses, while the validity of the Otis Advanced Intelligence Scale was .382. A multiple correlation of .69 with grades in advanced courses was obtained for four variables: grades in three freshman courses and the Otis test.

Law—The Ferson-Stoddard Law Aptitude Examination was found by Gaudet and Marryott (400) to be better than freshman grades in predicting grades in law school.

Medicine—Moss's reports (430, 431) on the use of his scholastic aptitude test for medical students, based upon a four-year study of 1,000 students and a three-year study of 5,000 students, concluded that "the aptitude test scores give a somewhat better prediction of what the student can do in medical school than any other single one." Cowdery and Ewell's study (383) of 45 first-year medical students confirmed this assertion. The Moss test correlated .636 with grades in medical school. When the test and pre-

medical grades were combined, the correlation was .764 with medical school grades.

Music—In a careful study by More (429), fifteen group tests of musical ability (ten being standard tests and five being new ones devised by the investigator) and an intelligence test were given to all entering freshmen of the School of Music of the North Carolina College for Women for the years 1927-30. A multiple correlation of .73 was obtained between college freshman marks in music courses and the four tests of the finally selected (arbitrary) battery. Stanton (453) found that a battery of tests of musical ability given to freshmen predicted successful graduation.

Nursing—Rosenstein (446) and Frankford (399) both found a relationship between intelligence test scores and trainability of student nurses. The former reported that 75 percent of those individuals dropped from the training school for scholastic reasons were below the 50th percentile on the American Council Psychological Examination. However, when he compared high and low groups selected by this test, he found practically no difference between the two groups on efficiency ratings in practical work. An extensive study by W. B. Jones and Ifert (413) of 777 students revealed a nursing aptitude test to be most highly related to their efficiency record, with the psychological examination a close second.

Teaching—The scores of 135 senior and graduate students on the Coxe-Orleans Prognosis Test of Teaching Ability were compared by Dodd (391) with scholarship and with supervisors' ratings of teaching ability at the close of the practice-teaching period. Correlations of .425 with supervisors' ratings and .636 with scholarship were obtained when raw scores rather than weighted scores were used. Part II of the test—a true-false test of professional interest—had a larger correlation (.454) than the entire test with supervisors' ratings.

As a general criticism of studies on aptitude it may be said that most of them make two probably rather invalid assumptions:

1. The aptitudes required for *learning* an occupation are the ones required for its successful *plying* later.
2. The judgments (mainly or solely) of supervisors and overseers are inadequate measures of the success which the tests were designed to anticipate. Regarding the latter point, Bowman (373) has shown that probably all of the teaching aptitude tests thus far devised, numbering many dissertations, are largely useless because no group of teachers in such an investigation has ever been rated as to true "teaching ability."

Mechanical aptitude—This subject has received relatively little attention since the researches of the Minnesota group and Cox.

Clerical aptitude—O'Rourke (435) conducted an extensive research on the development of tests for the selection of stenographers and typists in cooperation with a number of industrial firms. Correlations of .71 and .76 with efficiency ratings were reported for employees in two different companies. The National Institute of Industrial Psychology (428) used its clerical test, consisting of seven parts, in the United States. Correlations of .87 and .94 are reported for two small groups of 18 and 28 respectively!

The Minnesota Clerical Test, a test of 800 items involving name-checking and number-checking has been developed by Andrew, as reported by Pond (441). It correlated .65 with ratings based upon personal history items, and .37 with supervisors' ratings of 138 clerical workers. The retest reliability was found to be .86. That the author was successful in getting a measure relatively independent of intelligence is shown by the low correlation of .25 with intelligence. Further experimentation has demonstrated this test to be the most sensitive of a number of clerical tests in distinguishing the various grades and classes of clerical workers and in differentiating between employed and unemployed clerical workers (370). A correlation of .65 between ratings for 54 clerical workers in a mail order house and scores on a test for ability to add was reported by Kinney (417). Pond and Bills (440) have found a significant relationship between intelligence test scores and grade of clerical work engaged in.

Miscellaneous—Diehl and his associates (390) found that of the many variables investigated, only name-checking, number-checking, and physical defects were related to captains' ratings of policemen.

Lovett and Richardson (422) reported on the significance of various types of test material in distinguishing sales ability and sales managerial ability on the basis of an item analysis of a test battery of about 900 items.

The problem of eliminating incapable automobile drivers has been receiving a good deal of attention all over the world, but most articles on the subject are discussions of the need for some method of spotting the dangerous drivers, or of the kind of tests which *might* be useful. A few experimental studies are reported in the literature. Miles and Vincent (426) found a correlation of .77 between driving efficiency and the test for motor drivers conducted by the National Institute of Industrial Psychology. Forbes (398) reported the use of an apparatus which reproduced in miniature in the laboratory the conditions of driving through traffic. Thirty-one commercial drivers and fifty university students were tested. The test had some discrimination in picking out the accident-prone commercial drivers from the others.

Bingham (371) reported a study of twenty-four variables in relation to accident-proneness of street-car motormen and bus operators of the Boston Elevated Railway. Accident-proneness was found to be associated with lack of aptitude, personality defect or uncooperative attitude, and health defects. Application of the resulting selection method effected a decrease of 43 percent in collision accidents over a period of four years.

Accident-proneness may be considered as the tendency to have accidents. In this field, Henig (404) found that the more intelligent boys in a trade school had fewer accidents. Farmer and his associates (397), however, did not come to the same conclusion in their study of dockyard and R. A. F. apprentices. They did, however, find some relationship between accident rate and performance on their tests of sensory-motor coordination.

Studies and discussions on aptitude for the occupation of aviation pilot are reported from France, Italy, Spain, Russia, Argentina, and the United

States, but few give objective results. DeFoney (388, 389) reported a study of 628 individuals who were given a psychological examination previous to training as pilots. The low group, given training in spite of their low ratings on the examination, had a "crash rate" twice as great as that of the men who had high ratings.

Test Administration

Effect of long test periods—The question of whether or not long test periods result in a loss of efficiency led to a study by Noll (432) of students taking a three-hour battery of tests. Performance on the Peterson Uniform Equation Completion Test was taken as the measure of efficiency before and after the main test period. The students were found to be slightly more efficient after the testing than before.

Time-limit versus work-limit—Workman (479) and Porter (442) found that administering the Ohio State Psychological Examination by the work-limit method produced higher validities than the time-limit method in the prediction of college scholarship.

Efficiency test forms and scoring methods—J. C. Peterson and others (437, 438, 439) have been prolific in the matter of producing efficiency methods of test scoring. Their methods call for answer sheets separate from the test proper. One method of scoring consists of punching holes through batches of tests in the correct answer position; scoring is then a matter of counting correct answers as indicated by the perforations. Another type of answer sheet is treated so that heating the test brings out a sympathetic ink which has been printed on the correct answer positions. Still another, useful for self-scoring test use, is made so that when the subject dabs the intended answer position with a piece of moistened felt it turns blue if the answer is correct and red if it is wrong. The characteristic of an immediate check upon the student's answer makes this kind of test a promising one for use in the learning situation.

The Clapp-Young Answer Booklets are sealed answer folders with carbon applied inside so that when the subject answers a question correctly an "X" is registered in a square. Scoring then becomes a matter of opening the blank and counting.

A scoring machine which quickly scores each test, prints the score on the test, indicates the wrong answers, and makes a record of the number of times each item is missed, has been invented by Pressey (443) and Little (421). The subjects use hand-punches in indicating their answers on the answer card. In the classroom situation, students' tests are scored as soon as they are completed. When everyone is through, the instructor is able, by looking at the item record, to discover the items on which the most errors were made and to discuss them immediately.

"Krexit" is the trade name of a machine which is used to print red circles in the correct answer position on the answer cards after test has been taken. This is similar to a method used by Toops for printing-press scoring which

blocks out all the incorrect answers. Scoring is reduced to the operation of counting the number of right answers.

Cuff (386) developed a device for scoring answer pads in which the subjects have indicated their answers by punching holes in the answer sheets with pencils. Small metal cylinders are dropped through the holes and weighed, the author reporting that speed and accuracy of scoring by this method are much greater than when scorers count the right answers.

A test booklet which is particularly well adapted to large-scale test programs has been developed by Toops (464). The Ohio State University Psychological Examination Form 18 has been so devised that the answer pads may be removed and attached at will, allowing the test proper to be used many times, and bringing the per-pupil cost of a testing program to a very low figure. The test subjects use pointed styli for piercing the test pad to indicate the intended answers. The test pads are then taken apart, yielding three identical pre-scored copies for each subject. These copies serve as records of the students in offices of the principal, superintendent, and central research bureau. The tests may be easily scored by the pupils themselves since the correct answers are indicated inside the answer pad, and since each copy of a given pupil's three answer sheets bears no means of identification other than a common printed individual serial number. Accordingly, when a given pupil's three sets of answers are reassembled the teacher may easily check all three records, which, agreeing, render unnecessary additional official scoring, and supply three correct scored copies for as many different offices.

Summary

Several heartening signs of vitality are apparent in the aptitude testing field. One of these is the growth of cooperative statewide testing programs directed toward measuring the achievements and capacities of young people in order that they may be aided to the most effective individual development. The follow-up and evaluation of the results of experimentally-controlled testing and guidance programs are equally significant of the times. Another is the effort toward obtaining more adequate criteria of occupational success through defining more specifically the objectives of education, and through the development of more valid measures of industrial success. Still another is the marked progress being made in the matter of more efficient test forms and administration.

A number of characteristics of aptitude testing when weighed in the scales are found wanting. Developments in the field to be particularly desired are the use of more adequate methods for combining tests and test items, the use of standard groups for reporting validity and reliability in order that published coefficients shall be comparable, and the interpretation of test scores in terms of the individual's position on his own growth curve. The literature bears evidence to the fact that the problems are coming to be appreciated and that we may hope for their eventual solution.

CHAPTER IV

Test Construction and Statistical Interpretation

RECENT PUBLICATIONS show a growing interest in and dependence upon statistical method. Educational research cannot go full steam ahead until the main body of the profession has acquired at the very least the mathematical and statistical competence necessary to understand the appearing contributions.

Teaching of Statistics

Rather than further indulging in the popular pastime of disparaging the amount of mathematics necessary for educational research, attempts are now being made, notably by Brown (492), to determine the precise mathematical difficulties under which students of education taking statistics labor; and to escape these difficulties by a "psychological" text, embracing a series of self-scored diagnostic tests intended to determine and guide the student's specific needs for review and covering the essential mathematical topics (605). Walker and Durost (606) also sensed the need for three-dimensional models for the teacher's aid in making clear the concepts of statistics. Camp (495), a mathematician, has produced an excellent text on the essentials of mathematics for the study of statistics which does not presuppose a mathematics major preparatory to its study.

Estimates

The estimation of results is a well-recognized part of a good statistical training in order that one may not accept erroneous and ridiculous results, the product of computational error. That estimation can be reduced to a science was shown by Walker and Sanford (604); and that in certain cases estimation may replace actual computation was shown by Scates and Noffsinger (570). It would be quite worth the while to have the topic developed carefully in all its branches.

Patterns of Traits

Perhaps the most significant recent trend in statistics, in the reviewers' opinion, is the growing appreciation that all the factors entering into the educational business—human traits, educational environments, educational results, and educational costs—are not separate and isolated variables but more accurately may be represented by profiles. We must speak of patterns of ability (see Chapter III); environmental patterns; educational-result profiles; and patterns of student costs. The clinical analog is "types." But

"types" have several difficulties, not the least of which is the "word-handle" difficulty. Each type had to have a name—for the requirements of language seem to demand such—and either over-simplified human personality if only a few patterns were named; or, venturing in the other direction, were laughed out of court because of the multiplicity of names originated and the inability to specify, precisely, of what traits a given type was compounded. The statistical difficulties have been largely solved by Toops (595) who proposed a system of addends, mathematically derived, whereby each one of all possible patterns of profiles may be coded (and readily decoded) by a single unique code number. Accordingly, whenever the traits of personality shall have been analyzed into the half dozen, more or less, unique traits of which personality is compounded, we shall be able to talk of a person whose profile number is 318. Such a person differs from a person of profile number 317, say, just one degree (say tertile) on one of the unique tests. In wholesale statewide or nationwide testing many persons of each such profile number will be located, and these, later occurring in many "natural experiments"—going to college, getting married, becoming college professors—will yield each their several "probabilities" of "success." Accordingly, it may be safe to prophesy that we may expect shortly to see more of this "single variable" type of experimentation.

The psychologists and test-makers are not alone in their interest in patterns of human ability. The sociologists, interested in the traits and the resulting behaviors of societies, are beginning to see that "like-constituted" groups may be expected to have "like-behaviors." Burt (494) devised a machine, essentially a counting Findex, called the selecto-meter, to locate, in a peg-represented list of persons, these like-constituted individuals. Beyle (488), a political scientist, has devised technics for sorting out the "like-minded" individuals among a group of congressmen, so that their future voting may be anticipated on the basis of their "attitude types." There is more than a faint suggestion that congressional speeches might be dispensed with, not to mention the actual mechanics of voting, if we could know, in all their statistical ramifications, just whom we had voted into office last November!

Brolyer (491) raised a fundamental question when he asked, and solved, the query, "How reliable is a profile?"

The selection among profiles of human ability which the occupations, progressively with time, effect, has been attacked by B. J. Dvorak (513). This publication is another evidence of the growing awareness among research workers that the composition of groups in terms of profiles, and of greater groups in terms of their component lesser societies, each with its component traits and patterns of individuals, is a profitable field for exploration. Thus far the societies to which a man belongs have been left out of our regression equations, which, moreover, are representations by man's ability rather than *a* man's.

Statistics of Crowds and Societies

The statistics of groups, crowds, and societies, in the light of the traits of the individuals of which such are composed, are in the main yet to be developed, although the basic formulas have been available for some time and occasionally are rediscovered or given a new twist, as in a report of Horst (535).

Equational Representation of Aptitude

The sensed inadequacy of the basic technics have given rise not only to such developments as the above, but have given rise to doubts as to the adequacy of the simple regression equation concept, which long has been under fire, particularly on the part of those more influenced by poetic, philosophic, or clinical case history zeal and considerations than by the rigorous demands of statistical logic. Such criticisms eventuate in little that may be put to a statistical test until such a concept can be couched in the form of an equation. Kelley (541) and Toops (592) have advocated regression equations of the multiplicative order, i.e., involving *products* of test scores in place of their weighted additive *sums* as in the ordinary regression equation. These, when applied to the problem of predicting college success to date have not worked a revolution in the validity coefficients (528, 565). Such are at least one answer to the criticism of Johnson (540) who deplored the use of additive regression equations only. Such an equation may take at least some account of such observations as these:

1. An aptitude may be zero even if all but one of its "determiners" are present and favorable, if that one is of zero amount.
2. Concretely, a student's scholarship may be zero, no matter how bright he is or how hard he studies, if the text is so difficult that he cannot at all comprehend it.

Still more complicated regression equations, readily fitted by least squares methods, have been advocated by Toops (588). Curves involving second powers, for example, have the property of rising to a maximum and then descending, a phenomenon, associated particularly with time, as for example, the well-known phenomenon of the growth of height. Such equations, of course, are too absurdly simple to be maximally useful, and probably we shall make little progress until we begin to employ real growth equations of such a degree of complexity that they stand a fair chance of being a good approximation to the "true" equation. The reviewer hazards the guess that Will's equation (613) is of this minimal degree of complexity, since it has the property of rising to a maximum and then declining to a fixed asymptotic lower limit, a phenomenon often noticed in population growth, a property of crowds analogous with the phenomena of inertia and momentum of physical objects in respect to motion. These physical notions of a society are being developed by Dodd, a psychologist recently turned sociologist.

Factor Theories

The factor technics are attempts to derive an analysis of man's capacities and abilities out of the internal consistency of their interrelationships as revealed in the intercorrelations of test scores. They may be humorously cataloged as an attempt to determine an equation without any equality sign and any left-hand member. These have been the rage of the past few years. The fundamental and earlier contributions of Spearman, Kelley, and Holzinger have been followed with later and fundamental contributions by Thurstone (581, 584, 585, 586); Hotelling (538); Spearman (574); and lately, Wilson (614, 615). The appearance of a new title by any of these is acclaimed with joy by a very small camp of enthusiasts.

The problem of factors is essentially the problem of the above-named analytical technics of patterns, but done by a different attack. So far, it must be acknowledged, the methods, the claims, and the speculations of rival camps, with the exception particularly of the main representatives of the camps above noted, have resulted in little other than excuses for magazine articles. Certain notable exceptions are Thurstone's analysis (582) of the fundamental interests of man; Moore's analysis (549) of the fundamental syndromes of the insanities; Reinhart's (561) and Asher's (484) attempts to derive an actual intelligence test by the use of factor technics; Anastasi's analysis (483) of memory; and Dunlap's analysis (510) of the learning of chickens.

If factor theories cease to be a religion and become a statistical technic they promise much assistance in the analysis of causation of human behavior; in important applications in test-building and aptitudes; and aid in the direction generally of learning, motivation, and social ameliorization so far as these can be effected through control of the human variables.

Analysis of Variance and Covariance

A different angle is the analysis of variance and covariance, a method favored by Kelley (541) and Snedecor (573). Causality has been treated abstractly by Dunlap and Cureton (509) and with respect to mental life particularly by Moore (550).

Wholesale Computation of Intercorrelations

The factor theories and analysis of causation require, generally speaking, all the possible intercorrelations, means, and standard deviations of n variables, where n may be quite large. Accordingly, we see much interest in tabulating machine methods of obtaining the host of moments necessitated. The first monograph (608) of the Columbia University Statistics Bureau has become a classic. It is fair to predict that the recent text (485) on the application of Hollerith machines is but a forerunner of a new day in statistical computation, and a sign that eventually a host of basic reference works will follow. Dunn (511) has devised a method of punching as

many as 80 variables, each of 4,095 inclusive range, into a single Hollerith card, or a corresponding number of other punch-card equivalents, e.g., 240 variables of 15 scores each. Royer and Toops (568) have shown that these 240 variables may consist of 15 coded scores, thus fixing the limits of present-day statistical machines at 240 variables, each of unlimited range. They have also developed the mathematics of the method. Before inclusive growth studies of all the varied functions of an individual may become feasible we shall have to render unlimited not only the number of persons and range of scores, but also the number of variables per person.

Printed Correlation-Solving Forms

Three new printed correlation forms have appeared, prepared by Cureton and Dunlap (503), Smeltzer (572), and Tryon (600); five variations in methods of correlation-solving, by Chapin (496), Constance (498), A. Dvorak (512), Feldstein (516), and Stephenson (576); a method for solving the standard deviation by stencil by Toops (589); a method for solving mean square contingency by Royer (567); a stencil-method of fitting straightline trends, regression of Y on X with one plot per X-unit, by Toops (591); several methods for simplifying the computations of partial correlations, multiple correlations, and multiple regression equations, by Bakst (486), Franzen and Derryberry (518), Peters and Wykes (559, 560), Thomson (579), Griffin (525), Horst (533, 537), Wherry (610), Brolyer (490), and Adkins and Toops (481). A new least-square curve fitting machine, for fitting straightline trends, or logarithmic equations in the linear form, has been devised by Gaines and Palfrey (519); and their use of the correlation coefficient to compare the efficiency of their machine with the ordinary algebraic methods has been criticized by Berkson (487). A machine for the solution of determinants up to the tenth order has been invented at the Massachusetts Institute of Technology, an institution already famous for its tide-predicting, integrating, and other complicated mathematical machines.

Research workers have become nomograph-conscious since the publication of Dunlap and Kurtz's classic *Handbook of Statistical Nomographs, Tables, and Formulas* (508). Other contributions to the literature have been made as follows: for standard errors of differences, by Edgerton (515); for Blakeman's test of linearity, by Griffin (522); how to construct a nomograph, by Griffin (521), and a text by Allcock and Jones (482); for the coefficient of part correlation, by Griffin (524); for the Brown-Spearman formula, by Griffin (523); a book of charts for computing tetrachoric r , by Cheshire, Saffir, and Thurstone (497); and for the standard error of biserial r , by McNamara and Dunlap (544).

Tables

Tables for facilitating computations appearing in the past three years include: general statistical tables for students of educational statistics, by

Holzinger (531); Part 2 of Pearson's *Tables for Statisticians and Biometricians* (557); tables for inter-percentile ranges, by Masters and Upshall (545); and for $\log(1-r^2)$ $\frac{1}{2}$ useful in partial correlation, by Mori (551) the text being in Japanese, the tables in English.

Slide Rules

Slide rules have been much in evidence, also. There are three for calculating ages: two by Constantine (499, 500), the second giving ages to days, and one by Yepsen and Dunlap (616), giving quotients for I.Q.'s as well. A generally useful statistical slide rule was developed by Dunlap and Kurtz (507). Heinemann (530), in Germany, discussed experiments to note the comparative excellence in use of four styles of slide rule, and voted finally for "simplicity."

Matched Groups

A formula has been developed by Peters and Van Voorhis (558) which makes allowance for the coefficients of reliability in computing the standard error of the mean. The formula, $\sigma_M = \frac{\sigma_x}{\sqrt{N}} \sqrt{1 - r^2}$, approaches zero as the reliability of the measure used approaches unity. In the case of zero reliability, the correction for reliability disappears (becomes unity) and the formula reduces to the usual one for the standard error of the mean.

This property is particularly important as revealing that much smaller than usual critical ratios are, under the conditions implied, "statistically of significance." The article is taken from the chapter on reliability of a statistical text promised for early appearance from the Pennsylvania State College Press.

A similar formula reported previously by Wilks (612) and Lindquist (543), allows adjustment for the correlation between the variable, on which groups are matched, and the variable being studied. The correlation between the two variables, r_{xy} , is used in the above equation instead of the coefficient of reliability. When used in obtaining the standard error of the difference of means, use of the formula eliminates the necessity of laboriously matching individual with individual, but requires only the equating of groups on the basis of means and standard deviations. It also allows the use of groups of unequal size.

Rulon and Croon (569) described a method of eliminating cases from different groups so as finally to obtain groups with equal means and standard deviations on the measure on which they are to be matched.

Probable Errors

Cureton (504) published an epochal monograph on the probable errors of many of the constants most used by educational workers. Other probable error formulas recently devised are: standard error of a multiple

regression equation, by Miner (546); of a tetrad in samples from a normal population of independent variables, by Wilks (611); of the average intercorrelation and of the average criterion correlation, by Cureton (505); and also of the Spearman-Brown formula (506).

It remains to be seen whether big-scale research, with its tens of thousands of cases, will make probable errors unnecessary, or whether we shall go to the other extreme and try to conduct our experiments with hardly any cases at all. Fisher's treatise (517) on small sampling theory has become a classic for the biologists, agronomists, animal psychologists, and others who cannot well afford to indulge in statistical sprees of hundreds of thousands. So likewise has become Shewhart's study (571) in the eyes of manufacturers who cannot afford to demolish even one \$100,000 machine to guess whether the remaining nineteen ordered by a customer will work or fly to pieces. Certain it is that a probable error seldom—much more seldom than should be the case—has been used to control the course of educational experimentation. Usually such coefficients have been calculated for publication as an afterthought, on the insistence of the embryo Ph. D.'s major adviser. It is well known that the famous dictum, "If you knew the history of a single tree you would know the history of the universe," was intended for rhetorical effect rather than for practical application. Nevertheless, our analysis of causation and our notions of reliability are bound up in our notions of the causes, sources, and amounts of error. It is hopeful, as well as humorous, that a new *variety* of error is announced monthly!

Scoring Formulas

The new test-scoring machines and test forms in themselves have not led to any new formulas, and it is axiomatic that a new formula in time leads to a host of new concepts and practices. Motivated by the development of such devices, however, we have a promise in the coding methods developed by Toops (595), and their accessory formulas, not only of painless test-scoring and regression-solving (using scoring books), item analysis, and multiple-choice-alternative-weighting, but also of a basic attack upon the problem of profiles of human ability.

The Strong Interest Blank has been revised in its scoring-method and adapted to Hollerith machine scoring (hand selection of the recorded responses) by Strong and Green (577); and the International Business Machines Company (485:19) have devised an attachment for their tabulator making pre-sorting of the cards unnecessary. Stagner (575) devised a mimeograph *additive* method of weighting tests for which multiple regression weights are available. Negative weights are overcome by adding a constant of sufficient size to each WX product to render all positive, and this is finally corrected for (subtracted out of) the constant term of the regression equation. The method has been adapted to the multiple-ratio technic by Toops (594).

Criteria

The obtainable validity of tests is limited by the reliability and validity of the criterion used. Since the classic treatment (556) there have been several basic contributions. Thorndike and his associates (580) employed wages, job satisfaction, and level of work attained as measures of occupational success. Hoppock devised a scale for measuring job satisfaction. Richardson and Kuder (564) used a checking of "specifics" blank, evaluated by the Thurstone attitude scaling technic as a substitute for supervisors' ratings in deriving a criterion. The employment of these will improve the criteria of the future. Easley (514) pointed out the increased reliability of long-time samples as versus short, and the possibility of greater validity thereby attainable. We cannot escape the need for more samples of our criterion. Turney (601) pointed out that a number of short tests have a cumulative reliability. The reviewer suspects that many short tests have the property of keeping effort at a maximum, so that the final examination more nearly reveals the true ability of the student. If study time be reduced to a constant, as at West Point, the validity of intelligence tests jumps markedly as shown also at Yale (556). This, in connection with Courtis' observations (502) regarding the hodge-podge nature of our measurements and particularly our disregard of the *intent* (motivation) of the testee, suggests that our criteria are hodge-podges that could not be expected to be predicted well by any tests, however good.

The problem in its essence is "What constitutes success?" It is clear, then, that practice in this realm will be benefited by whatever advances are made in factor theory, causation, variance, and patterns of traits. Edgerton, in an unpublished manuscript, proposed to find that system of least-square weights for the several criterion components, or variables, which, with a similar series of weights for the several tests of the test series, will maximize the correlation between the two sides of the equation.

Hotelling (539) solved the same problem by an appeal to a type of mathematics which will be unintelligible to most readers of this review. Whether the problem is answered philosophically by these mathematical solutions is an open question. Success is a profile. And when John Citizen, now prognosticated to be of average aptitude for occupations A and B, is faced with the alternative of choosing between A, in which he is predicted to be fast but inaccurate (therefore averaging out to mediocre), and B, in which he is predicted to be slow but accurate (again averaging out to mediocre), may greatly prefer to choose the latter in preference to the former. It is only, or mainly, for wage-payment purposes that we require a unitary criterion rather than a profile. And when it is realized that wages are a means rather than an end, even wages may be paid on the basis of a profile of need: so much for food, so much for recreation, so much towards the publication of a book—whatever are the purposes of the recipient which wages may foster into a more abundant life. We, too, no doubt would pay our debts more gracefully if they were detailed (a profile), so much

of taxes, for example, for police protection, so much for water-main repair, etc., instead of the uninteresting lump sum, "Taxes for six months, ending June 30, \$100."

Ratings

Swab and Peters (578) showed that pupil estimates of fellow-pupils have considerable validity in the case of estimating age, height, and marks in arithmetic, but do rather badly in estimating brightness. The reliability, for 30 cases only, ranges between .95 and .99 for six traits. These results suggest the employment as a research procedure of pupils' judgments of pupils. Remmers (562) and Adams (480) suggested inserting in rating scales judgments of objective qualities such as length and weight as a means of measuring and eliminating halo and of measuring the effects of and giving practical meaning to such concepts as accuracy, error, and reliability. This is an improvement over Thorndike's practice of inserting, say, beauty, as a joker to test the presence, but not very precisely the amount, of halo.

Criteria may be improved by such methods, employing these technics to test, pick, and choose (or weight) our judgments, analogous to the several technics now being used to select, discard, and weight tests, sub-tests, and items.

Reliability and Validity

In a similar attempt to improve reliability we have the well-known methods of (a) lengthening the test; (b) interviewing and cross-questioning the experimental subjects regarding their failures on individual items; and (c) working for internal consistency of the items by statistical means. We might hazard a guess that factor theories ultimately will be found useful here. The method of lengthening the test naturally languishes since the trend of the times has been towards shorter tests (results being equal), and since it is thought by competent people that it is more meritorious to work for greater validity and allow reliability to shift for itself. Employing this principle, the method of interviewing has been used by Valentiner (602) in making tests more valid. A method, called the L-method, of shortening a test while maintaining its reliability (equally applicable to making a test shorter while maintaining its validity or to the construction of alternative forms of test) was devised by Toops (596) and used by Royer and Toops (566) and by Hartson (527) for picking tests and sub-tests of the greatest in-combination validity, as an alternative to multiple correlation procedures. Its basic concept is that a feasible or *practical* test must have the elements weighted with *equal gross score weights*; and the necessary formulas, involving in effect the intercorrelation coefficients (actually the gross score intermoments), are deduced and applied to that problem. The process works by the build-up-a-scale proc-

ess, quite the converse of multiple-correlation methods where enormous regression equations must be solved and the tests (or sub-tests, or items) of low weights then must be discarded.

A text in the combined field which bids fair to become a classic has been written by Thurstone (583).

Item Study

The validity of a test, as well as its reliability, is conditioned by the items of which it is composed. That an item has validity, difficulty (mean score or percent right), and even reliability, puts the item in the same statistical category as the test or sub-test, with the added advantage that, existing in two degrees only (Right = 1; Failure = 0), it admits of the application of various probability and other technics not applicable to multi-categorized test scores. These technics have been reviewed recently by Osburn (555).

Transmutation

Heilman (529) achieved a transmutation of test scores by correcting for differences in mean, but not for differences in standard deviation.

Toops (590, 599) raised the issue of translating, by means of the regression equation—which corrects for both—high-school marks obtained on university students originating in many high schools. He proposes to employ transmutation equations computed individually for each high school of a state, the principle being that pupils of like intelligence (or of a common score on tests of capacity or attainment) should be transmuted to the same transmuted mark, no matter what the marking system. This corrects not only the marks of the average pupil, but differentially those of either extreme as well. It ignores motivation and quality of instruction by assuming these equal in different schools for pupils of like intelligence. Ogan (553) established the principle that both a pupil's intelligence and his marks in other subjects should be used to determine whether a particular instructor has the "proper" distribution of marks, thus equating for both intelligence and motivation so far as the latter is measured by "marks in all other courses but this." By such means criteria will be improved.

Horst (532, 534, 536) published three articles on the matter of obtaining comparable scores in distributions.

Toops (594) contributed a method whereby qualitative data may be quantified and then employed in regression equations as readily and as meaningfully as strictly quantitative data. The principle is that categories must be quantified by assigning to each, as a transmuted score, a quantity proportional to the average criterion score of the category in question. The same principle rectifies curvilinear regressions. Bingham (489) suggested that qualitative data may be accorded a transmuted score which is the percent of those individuals of the category in question who attain "success,"

this being arbitrarily defined as a "passing point." All of these indicate a healthy striving for "the proper units" of measurement.

Norms

Courtis (501) pointed out that norms are all but meaningless unless we take into account the characteristics of the individual's growth curve. As an extreme illustration, a person growing at a normal rate, one year of mental age per chronological year, and therefore destined ultimately to attain a normal adult intelligence, may get a late start and so year by year improve in I. Q. As a corollary, an I. Q. of an individual cannot be ascertained by one measurement alone, three being the very minimum necessary.

O'Rourke (554) pointed out that the proper norms (standard scores), based on the groups in industry with which a pupil later will compete, are essential to the construction of profiles for guidance purposes.

Technics of Selection

The line between guidance and selection is always a thinly drawn one. That the two are not necessarily incompatible if we look at the matter from the educational statesmanship view, was shown by O'Rourke (554) and by Toops (590, 593) who (597) also pointed out the dangers of the at present much used and much abused successive hurdles method of selection. By transmutation of marks and collection of other to-be-had-for-the-asking variables the seniors of the high schools of a state may be ranked on a scale of college aptitude which will be most useful in college recruiting, and, if wisely done, serve the ends of good guidance, since college is one of the "opportunities." The necessity for a measure of "financial need" is pointed out.

Standardization

That statistics is difficult because of its lack of standardization of symbols and formulas was shown by West (609) and Yntema (617). Monroe (548) proposed that a certain list of statistical symbols be regarded as standard; while Toops (598) proposed standard codes for coding qualitative data, and transmutation equations for quantitative data.

Novel Applications of Statistics

Reymert (563) used the bids technic to create a scale for measuring the ability of the psychologists of the several colleges of a state. Ward (607) used the multiple-ratio procedure to ascertain the salary formula of a college faculty as a means to setting up the proper faculty record forms. Burgess (493), Glueck and Glueck (520), Tibbitts (587), Vold (603), and Monachesi (547), sociologists, employed the traits, environments, and treatments of prisoners as "presence-absence" variables, reversed if

the correlation were negative, to predict ability to succeed on parole, and obtain validities which should figure out to a coefficient of .50 or better. Kurtz (542) employed the multiple correlation technic to determine the point-values which statistically should be allocated to letter grades in college courses, utilizing as criteria two measures of subsequent success—persistence and graduation—and two measures of previously demonstrated ability—high-school marks and intelligence. Thus, marks of A, B, C, and D may be accorded positive weights of 4, 3, 2, 1 without much error, from the viewpoints of subsequent predictability and subsequent use as prognosticators of persistence and graduation; but the grade E (failure) must be accorded a sizable negative score if we would properly account for its deleterious effects on persistence and graduation, thus raising an interesting problem in the *motivational* possibilities of marks.

Nanninga (552) fitted exponential curves to his data regarding costs, size, and offerings of California high schools. Courtis (501) devised growth equations and a rotation capable of taking account of superimposed cycles of growth. Gulliksen (526) computed a rational equation of the learning curve based on the law of effect (motivational effect of satisfaction or dissatisfaction), one of the few attempted rational equations of psychology. This, together with Thurstone's earlier logical learning equation, comprises practically all the logical equations the educational psychologist has to show for his labors to date. No treatise on the methods of derivation of logical laws seems to be available, although the month that does not bring forth a new statistics text is rare indeed.

Summary

The high points in statistical development of the past three years are:

1. Definite attempts to improve statistics teaching and statistical reporting, through analysis of the mathematical and learning difficulties of students and through standardization of statistical symbols, procedures, and forms of reporting
2. Introduction of the topic of estimation on a scientific basis
3. A growing literature on profiles and patterns, their representation and significance, a logical development of the recent emphasis upon factor theories, unique traits, and the "elements" of behavior generally (Having the elements at hand, we must compound them. The result is profiles.)
4. The growing realization that the profile, rather than a single index, is the most meaningful way to represent all the "variables" in the educational process—human traits, environments, occupational (including educational) results (criteria), and costs
5. Wholesale, statewide testing programs with their inherent research possibilities of locating all persons of profile number 318 for follow-up study and comparison with those of profile number 317, an alternative to multiple regression methods
6. The possible subsequent utilization of all human experience—"natural experiments"—as criteria
7. The growing interest in the characteristics of a group in the light of the sub-societies of which it is compounded
8. Excursions into the domain of more complicated equations, particularly those in which *time* is a function; and the provision for multiplicative as well as additive relationships

9. The appearance of a few applications of factor theories among a host of theoretical articles on the topic

10. Immense advances in applications of statistical machines to research, and in the means of representation of statistics, and the utilization of qualitative and irregular data (A healthy interest in the units of measurement is noted.)

11. A goodly and much-needed beginning in the theory of criteria

12. Progressive developments in multiple regression solving, in item analysis, and in alternative technics of test building

13. A beginning by two or three persons of the utilization of time in equations and of consideration of the possibility of logical laws in place of empirical laws

14. A growing number of applications of statistics to novel problems.

By way of criticism and suggestion we may note that:

1. Our concepts of success and its measurement by criterion scores are in a chaotic state, particularly the foundational philosophy.

2. The development of logical equations is scarcely appreciated as a need by the rank and file of research workers. No text on the methods of logical derivation of laws seems to be available.

3. Few experiments are ever repeated or reverified.

4. We need equations which shall take account of the effect upon the individual's products (criteria), not only of his traits but also of his associates and environments.

5. We may be lulled into a false sense of scientific security and well-being by the ease with which soon we shall be able to do researches by the available methods, and in our preoccupation with quantity of research may fail to take account of the need for laws and equations which are more complicated but more true to life.

6. There is a danger that the development of small sample theory and the new formulas for unreliability coefficients may be used as excuses by many for slipshod research on too few cases. The publication of unreliability coefficients (even small ones) does not guarantee the reliability or validity (the dependability) of research.

7. There is a general failure to consider any test score as a cross-section view of a time-growth curve with all its statistical implications.

8. There is a need for the development of statistical machines which shall render unlimited not only the numbers of persons and the range of the variables, but also the number of variables. To treat each of a hundred variables as a growth process, annually measured, will require, say 2,000 variables per person.

9. There is need for the statistical and theoretical development of the topics of transmutation, employment of qualitative data, and statistics of societies in the light of their component sub-societies and individuals.

10. There is need for the theoretical development of the statistical and philosophical relationship of guidance and selection, viewing the problem as a national, or international problem in planning; and for a succinct statement of the statistical theories of selection now implied in such practices as the successive hurdles method of the schools in occupational preferment, the practices of civil service, of honors-granting bodies, and of employment bureaus in industry.

11. We need researches into the salary formulas of schools and industry, a problem growing out of the preceding one.

CHAPTER V

General Survey of the Field of Character and Personality Measurement

IN TREATING THE MATERIALS for the present issue of the *Review of Educational Research*, the writers have taken as a broad basis for division the general dichotomy of implicit and explicit behavior, personal and social, or internal and external. Inner adjustment, interests, and attitudes are represented in Chapters VI and VII. In these divisions we have the person's feelings, emotions, conflicts, and verbalized attitudes toward various issues. It is recognized that these may be independent of, or only partially dependent on, information, and may or may not be expressed in action. All technics of personality study which utilize an external observer have been treated in a final chapter (VIII) under the general heading of measures of information and conduct. In the general division, tests of information concerning laws, customs, and conventions have been treated as overt performance, since they have an objectivity in the external situation. The classification adopted does not, of course, entirely avoid overlapping on the basis of topics, methods, or particular investigations.

The volume of pertinent material in the three-year period has necessitated a selective treatment. An attempt has been made to retain references which illuminate the general issues, develop new technics, or summarize bodies of material. A number of bibliographic summaries, books, and journals have appeared which cut across the plan of division of the report or are indicative of trends which affect the field as a whole. These are described in the present chapter.

Reviews and Books

Watson (634, 635) published comprehensive reviews of the field in 1932 and again in 1933. These have been brought down to July, 1934, by Maller (625, 626), who has also made an intensive three-year study of publications in the German psychological literature (627). A convenient list of character and personality tests and ratings may be found in Hildreth's general bibliography (622). The compilation gives author, publisher, and a pertinent reference to each instrument available up to about 1933. Some of the better known tests and ratings for social adaptation have been listed by the United States Office of Education (630).

Fauville (618) reviewed experimental studies dealing with the structure of personality. His interest was in the mutual relationship between physical, temperamental, and character traits. Jones (623), in addition to a review of the general literature on methods of character measurement, presented a tabular summary of test situations which have been employed

for performance, knowledge, and attitudes. Garrett and Schneck (620) devoted one chapter in their general treatise on psychological tests, methods, and results to the measurement of personality and temperament.

Haddock and Ellis (621) prepared a source book for the use of persons engaged in teaching or studying the development of character. The authors give an account of the history of the study of character and personality from about 415 B.C. to the present. The book contains a bibliography of 303 titles and 18 pages of subjectmatter index.

The book by the Murphys (629) on experimental social psychology gave a critical review and discussion of many of the current investigations in social relationships. Murphy and Jensen (628) dealt with a general theoretical organization of personality research, including the approach from experimental psychology, from psychoanalysis, and genetic study.

Symonds (632) prepared an exhaustive treatment of methods for diagnosing personality and conduct. Observations, rating methods, questionnaires, tests, free association methods, and physiological measures were considered. Special chapters were also concerned with the technics of interviewing and psychoanalysis. Judgment of character from physical signs and measures of the environment received consideration. This work was followed by a treatment (633) of character and personality data with particular reference to social adjustment as concerned with criminal tendencies, mental disorders, vocational fitness, and citizenship. A helpful classified descriptive list of tests, questionnaires, and rating scales was included.

The annual summaries of research in progress which have appeared in the *American Journal of Sociology* indicate that the problems of personality in relation to the culture represented a predominant interest of both students (631) and mature investigators (624).

New Journals

The three-year period covered by this *Review* has seen the birth or major development of several periodicals devoted wholly or in part to problems of character and personality. The *American Journal of Orthopsychiatry* (145 East 57th Street, New York City), was begun in 1930. The emphasis of the *Journal* is on clinical approaches to treatment. Practically every issue, however, contains articles based on standardized test situations for measured appraisals of personality or social factors or on the statistical treatment of qualitative items. *Child Development* (Williams and Wilkins Company, Mount Royal and Guilford Avenues, Baltimore, Maryland) began publication in March, 1930. It regularly carries material pertinent to the measurement and development of character and personality in children. The journal, *Character and Personality* (Duke University Press, Durham, North Carolina), was founded as an international quarterly, with the first number appearing in September, 1932. The journal tends to be philosophic and speculative in character, but it is catholic in

its range and contains technical reports as well as material which supplies a frame of reference for measurement studies. The *Journal of Experimental Education* (Edward Brothers, Inc., Ann Arbor, Michigan) first issued in September, 1932 has devoted space to a number of articles on observational and attitudinal measures of personality. The first issue of *Character* (Religious Education Association, 59 East Van Buren Street, Chicago, Illinois) appeared in October-November, 1934. This periodical attempts to generalize and popularize technical material for persons who are responsible for programs of action.

Applications

A survey of tests by Fenton and Wallace (619) in twenty-eight child guidance clinic centers in the United States indicated that the bulk of clinical instruments in the field of personality and character represent editions or special scoring methods for the type of personal reporting initiated by Woodworth. This is, of course, the most convenient plan for clinical use since the patient must supply the information. The same general trend was found by Witty and Theman (636) with somewhat greater evidence of the use of tests of the May-Hartshorne type.

It would appear that the development of tests of conduct and information and of systematic observations and ratings in the social setting from which the child comes has affected only slightly the general practices of clinics.

Needs

While we are concerned in this chapter primarily with the present state of research on means of studying personality, it appears well to point out certain avenues of scientific thinking which suggest the need for new directions. While usually ready to concede the technical gains made in measurement approaches, the Gestaltists and psychoanalysts have also illustrated the desirability of a broader theoretical orientation upon which to build research programs which are concerned less with the peripheral responses and more with the internal aspects of the problem. There is need to use the quantitative approaches on the problem of how personality becomes organized in interaction with the culture, and to have more longitudinal studies in which persons are followed over periods of time.

CHAPTER VI

Mental Hygiene and Emotional Adjustment

Instruments for Self-Report

IT HAS BEEN common practice to devise a set of questions (or to modify a set prepared by previous workers) asking subjects to tell of their troubles, their symptoms, their desires, their behavior tendencies, etc. Wrightstone (758) used the oldest, the Woodworth-Mathews, to compare with teachers' case studies of pupils. Thurstone's schedule was criticized by Harvey (676), compared with clinical studies by Hanna (673), and with hospital diagnosis of psychotics by H. N. Smith. Willoughby (756) worked out a short form derived from Thurstone's and published norms. Bernreuter (644) combined questions by Thurstone, Laird (introversion), and Allport (ascendancy), adding scores for self-sufficiency (643) and defending reliability and validity (645). Marshall reported a try-out of the Bernreuter schedule on 371 consecutive patients in a neuropsychiatric hospital, showing the median psychoneurotic at the 80th percentile of the normal population in neuroticism score, the schizophrenics all above the 60th percentile norms on introversion, the manics all below the median in introversion. Stagner (729) agrees. Murray (705) arranged a set of 46 questions which differentiated emotionally maladjusted and delinquent boys (age eleven to sixteen) from controls. Cavan (657) modified this slightly for use with girls and reported a correlation of .6 or .7 with the scale of 24 questions used in the White House Conference studies. Ingle and Barton report giving 150 questions on emotional stability to college students. Whatever 75 percent of the people answered they called the right or "stable" answer, and anyone with twenty or more uncommon answers was labelled neurotic. This is typical of the worst in blind objectivity. White and Fenton (749) found their collection of questions differentiating little between delinquent boys supposed to have inferiority complexes, and normal delinquents. Bell (642) published a new adjustment inventory of 140 questions classified as bearing upon home, health, social and emotional adjustment. Smith's Self-Comparison Inventory (727) seemed to measure inferiority feelings among high-school students with satisfactory reliability. The Presseys (714) revised the X-O to permit scoring for emotional age. They found problem children more apt to fall outside the middle range of scores. Flowers compared the old Pressey X-O scores for 45 psychotic patients who improved enough to be discharged and found no difference between them and the scores of those who became worse.

Maller's Character Sketches (697) with two parallel forms contain statements descriptive of habits, self control, social adjustment, personal

adjustment, symptoms of mental disorder, and readiness to confide. The subject tells whether he feels that he is the same (S) or different (D). Reliabilities for the junior high school were found to be over .9. Correlations with Woodworth-Mathews and Thurstone ran about .6. Because of simple language and broad scope, this instrument is probably the best available tool for self-description by pupils of junior high-school level. Results with this, as with every self-report form, must be interpreted, of course, in terms of the impression the subject wishes to give.

Guilford (671) reviewed 115 studies on introversion-extroversion, noting as did Gilliland some low intercorrelations due to widely different definitions of the concepts. New questionnaires set up by Root, Roberts, and Kubo seem to add little. Studies by Stagner and Pessin and by Guilford contain painstaking statistical analysis of introversion-extroversion items. Guilford and Hunt (672) also found the rate of fluctuation of a reversible cube perception, previously suggested by McDougall as an index to introversion-extroversion, unrelated to any other supposed index of these types. Mierke (704) used as an index of extroversion the ease with which a subject, working at a pleasant task with unpleasant colors, would come to like the colors, or working at an unpleasant task with preferred colors would come to dislike the colors.

Manzer (700) reported self-ratings on the Allport Ascendancy-Submission Test to contain the usual distortion toward making a favorable impression. Beckman modified the A-S scale for business use.

Inventories to help make case histories more complete and more objective have been developed by Stefanescu and others (730), Scherke (723), and Patry (709).

The major new technic, so far as self-rating instruments are concerned, has been the applications of factor analysis. Willoughby (754) began with the six constellations Darrow had previously found in the Thurstone scale. In both multiple-factor analysis and two-factor analysis the category called "Fantasy" seemed heavily loaded with the first general factor, while the categories "Sex" and "Parental" showed least. The Guilfords (670) worked out the relationship of each of 36 items to a general factor of introversion. Thurstone's multiple-factor analysis suggested at least 18 group factors. Pallister (708) analyzed a battery of measures (Lecky's 200-question Individuality Record, a vocabulary test on 160 words, a personal data sheet, ten rating scales, and a set of physical measures) to find the relationship of each to a general factor: tendency of the person to withdraw from the environment. Perry (710) gave a battery (Bernreuter, Pressey X-O, Allport A-S, Colgate B2 and C2, intelligence, and achievement) to 300 college entrants. Ignoring the distortion of answers by the conditions under which the questionnaires were answered, he went ahead with correlation, tetrad, and multiple-factor analysis. He found some reason for believing that neurotic tendencies, dominance, and intelligence are independent variables. Present uncertainty regarding the psychological

value of the factor-analysis technic would seem to be supported by these studies.

Among other suggestions for advance in technic mention should be made of: Vernon's re-emphasis (739) upon the importance of the attitude of the person tested; Rosenzweig's proposal (722) that the subject be asked not what traits he has, but the question more likely to be truthfully answered, regarding traits he would like to have; and Uehling's argument (738) against questions too difficult and too pointed.

The usual criticisms of self-report measures are:

1. Subjects do not answer reliably.
2. Answers are arranged to make a good impression; this is particularly true of the more intelligent or experienced persons, and in situations in which they suspect that their vocational status may be affected by the outcome.
3. None of the available measures has been built by persons with sufficient clinical experience and insight to permit the instrument to be really diagnostic. Counting symptoms is not diagnosis.

A few investigations relate to these criticisms.

Cavan (658) checked the consistency of answers to a neurotic inventory by repetition within a week. Agreement was reported on 83 percent of the items. Siblings answering questions about their home agreed to the extent of 93 percent on factual items, and 62 percent on estimates. Bain (637) repeated 61 items of personnel information after 2½ months, with identical responses on only 77 percent of the items. Differences between items classified as "factual family," "factual personal," and "subjective personal" were not significant.

Hertzberg (682) repeated the Thurstone schedule after a year in college and found about 80 percent of the students showing some improvement in score. He found the usual zero correlations with intelligence and school achievement, although the "extremely well-adjusted group" both years earned fewer grade points than did groups at any of the four lower adjustment levels.

Luh and Sailer (694) found that self-ratings by Chinese students in China showed the same tendency to over-estimate one's own good qualities which has frequently been observed in this country.

No attempt has yet been made to construct instruments which will show symptoms in relation to underlying causes, patterns, or what Wertheimer calls the "radex" of personality.

Applications of Self-Report Instruments

No dependable results of scientific or practical interest have emerged from the frequently reported giving of some blank or other to delinquents and criminals (e.g., the Bernreuter by Hargan, the Neymann-Kohlstedt by Ball, the Thurstone by Garrison, and also by Simpson) with no controls. Simpson (725) found prisoners exceeding college students on favorable self-ratings. Stevens (732) compared 100 recidivists and 100 college

freshmen, finding the former more strictly brought up, more religious, less friendly with father, coming from larger families. Courthial (661) compared 82 delinquent adolescent girls with a much larger control group, equated for C. A., M. A., I. Q., home background score (Burdick test), and socio-economic status (Sims score card). Significant differences indicated fewer acts condemned, more worries (Pressey X-O), more symptoms of maladjustment (Woodworth-Mathews), more cheating (C. E. I. test), more persistence (C. E. I. test), more enjoyment in being alone, stronger preference for boy friends, more parental disapproval of friends, more dates, less family recreation for the delinquent group.

School success has been another tempting goal for prediction by means of symptom questionnaires. Stagner (728) reviewed 45 studies showing almost uniformly low, zero, or slightly negative correlations between favorable personality report and school achievement. His own correlation of grades with the Pressey X-O, his A-B-C questionnaire, the Allport A-S, the Laird C-2, the Neymann-Kohlstedt, Thurstone Neurotic Inventory, and the four Bernreuter scores showed only one coefficient as high as .15 with P. E.'s from .04 to .08. Hertzberg (682) found the same for freshmen in a teachers college. Flemming used four forms of score from the Pressey X-O and found correlations with grades ranging from $-.1$ to $-.3$. Hendrickson and Huskey found a relationship of $-.1$ (girls) or $.3$ (boys) between achievement and extroversion among fifth-grade children. Harris (674) studied 450 Jewish students entering City College, New York, and obtained correlations of many factors with grades. With intelligence held constant, partial correlations with age, weight, height, Payne's inferiority test, Marston's introversion-extroversion scale, number of recreations reported, number of periodicals read, hours of athletics, hours of sleep, number and kinds of books read, were all less than $.2$. Hours of study showed a correlation of $.3$ with grades when intelligence was constant. Symonds and Block (735) have published a questionnaire to help locate personal and social maladjustment in grades 7-14.

Applications to home life are implicit in Campbell's review (651) of 75 studies on personality adjustment in only children. Most of these found little evidence for the association of any type of personality with the only child. In Campbell's own work only children showed greater neuroticism and greater variability in scores on Bernreuter items, but no differences in physique or scholarship. Maller found only children rated as least cooperative, but less deceptive on cheating tests than any others except children from two-child families.

A. J. Davis (662) found a correlation of $.3$ between favorable answers on the Woodworth-Mathews and difference in M.A. between the child's parents. There was a correlation of $.2$ between "Scatter" on the Binet and the W-M score.

Harvey (678) reviewed ten studies of sex behavior and elsewhere he (677) appraised the value of questionnaires in such studies. He recommended: (a) use of a truly representative sampling; (b) follow-up letters;

(c) checks within the questionnaire itself; and (d) checks with physical examinations and personal interviews on samples of the subjects. Hurlock and Klein published a questionnaire study on "crushes" among adolescents. Childers and Hamil (660) studied case records on 469 children and concluded that there were most conduct difficulties among the 106 weaned from the breast between first and fifth month, fewest among the 137 weaned after eleven or more months. Leonard interviewed freshman college girls and their mothers on problems of college life.

An instructive method of study is the comparison of many possible factors which may differ in subjects well adjusted and those maladjusted. Cavan (659) reported that 30 percent of 9,000 adolescents have wished they had never been born. These children acknowledged many other maladjustment symptoms and were rated by teachers as maladjusted. The wish was more common among Mexican children, least so among negro urban children, but geographical and racial differences were minor. The unhappy children were more apt to be critical of both parents, to have no confidential relationship with the parents, to be punished often at home, to have no close friends. Lester and Barnette (690) compared college freshmen of the most maladjusted quartile (Thurstone test) with the best-adjusted quartile. They found the former group to be poorer in intelligence and achievement tests and slightly better in grades, with more business rather than professional fathers; to contain more Jews, more oldest children, but fewer only children; to be more introverted, less able to concentrate, more severely disciplined at home, and more apt to report their childhood as unhappy. Wang (744) compared the top and bottom 20 percent on each of five tests, using also other factors of personal history. Ascendant students reported reading more omnivorously for pleasure, being more admired by associates, participating more in games, liking foreign languages less. Introverted (as contrasted with extroverted by the Freyd test) had fewer playmates, needed urging to get into games, had practically no friends of opposite sex, went to shows alone. Stagner found introverts not reliably different from extroverts on any of ten speed measures (Downey W-T type) or on height-weight ratio.

The Bernreuter test was given by Carter (655) to 133 pairs of twins. Correlations of age (12-19) and I. Q. (73-140) with the four Bernreuter scores were all negligible. Correlations between monozygotic (40) pairs were .63 on the neurotic inventory, .44 on self-sufficiency, .50 on introversion, and .71 on the dominance scale. Correlation among fraternal-like sex twins (43 pairs) were for the same four items: .32, -.14, .40, and .34. For 35 pairs of twins of opposite sex, the correlations were .18, .12, .18, and .18. The reviewer rates this evidence for the inherited basis of self-report of maladjustment as probably the most valuable contribution in this field.

Reusser (716) applied Sweet's Personal Attitude Test for Younger Boys to 423 delinquents and a control group in the public school. The delinquents were more critical of the average boy, showed more feeling of being

different from other boys, less insight in telling how other boys feel, and a greater tendency to regard their own responses as ideal.

Mathews (702) constructed a questionnaire called a "Home Blank" which was given to 568 children. Each question of fact was answered "Yes" or "No" giving a "Condition Score," and also reacted to by "Glad" or "Sorry," giving an attitude score. A "socially approved" score for condition and another for attitude was worked out by noting the extent to which the child's attitudes were in agreement with what adult judges believed would be generally approved. The children whose mothers worked out had a socially approved condition score of 72, while those of non-working mothers averaged 78. On socially approved attitude the scores were 84 and 86, respectively. Happiness scores for children of mothers who worked averaged 84, for the non-working, 88.

Jersild and his associates (685) questioned 400 children, 25 boys and 25 girls at each age level from five through twelve, regarding fears, dreams, daydreams, likes, dislikes, most unpleasant memories, happiest memories, ambitions, wishes, and preferences. Repetition of the interview after five to eight weeks gave 65 percent overlap in the content. The study showed the relation of each type of affective response to age, sex, social status, and I.Q.

Other comparisons and correlations show: sex differences (Weinberg, Stagner); age differences (Stagner); women campus leaders more extroverted and with stronger inferiority feelings (Sward); Roman Catholic priests in training as unusually introverted and troubled with inferiority (Sward); and the attitudes and maladjustments of Jewish students (Maller). Maller and Lundeen (699) found a correlation of .55 between emotional maladjustment and acceptance of superstitions, within a population of 300 seventh-grade children. Carroll (654) found no correlation between art tests and temperament tests (Bernreuter, Bathurst) as high as .2. The deaf and hard of hearing seem definitely more neurotic, introverted, and submissive (Pintner, Welles, Lyon). Pressey found Indian children to have emotional attitude scores like those of white children about two years younger. Sunner found negro students at Harvard University much like the college white groups previously given a psychoneurotic inventory by House. Brotmarkle found no relationship between the Bernreuter scores and scholastic aptitude, mental ability, judgment, verbal discrimination, common sense, general information, learning ability, motor coordination, or moral vocabulary tests. Apparently the Bernreuter is also unrelated to the Kent-Rosanoff word-association test (Laslett). Intercorrelations are reported low by others (Pintner, Stagner, Flemming), except in cases in which the tests contain many identical elements.

Many of the investigations reported seem to confirm what anyone familiar with the psychology of personality would have expected. It is possible, however, to show that competent persons may not anticipate correctly the outcome of questionnaire studies.

Watson and Green (747) showed that graduate students of education agreed with recent investigations showing: men more apt than women to be happy in marriage, preference for parent of opposite sex, more dissatisfaction with marriage in the more highly educated partner, persons with siblings of opposite sex better prepared for success in marriage, etc. In general these educators were misinformed or in disagreement with findings on the wide age range for beginning menstruation, the importance for the wife's happiness of sex adequacy in the husband, the decreasing satisfaction with marriage after the first five years, the prevalence of serious lack of self-confidence, etc. Men were no better informed than women, married persons did not differ significantly from single persons in their accuracy of estimate, and age (twenty to fifty) was not a significant variable in most judgments.

Traits Tested by Behavior

British psychologists introduced the concept of perseveration and have been active in developing and applying tests. Stephenson (731) used in a psychotic population the w-w-w test, the z-z-z test, the e-e-e test, the grouped-strokes test, and the saying-color test. Each involves ability to shift from a simple practiced series to another enough like the practiced series to cause serious confusion. The average intercorrelation of the five tests, each taking less than five minutes, was .40. Correlation with intelligence (*g*) was -.26. Melancholia was characterized by high "p" and high "g," dementia praecox by high "p" and low "g." Manics and paranoid cases showed low "p" scores. In a retest after several months no "p" scores deviated by more than 2 points on a 20-point scale. Pinard (711, 712) used the inverted S test, the triangle test, the mirror image test, and an alphabet test with 300 socially or mentally handicapped children. Intercorrelations were between .3 and .4. Tetrad analysis showed a group factor present in all the tests. "P" score increased with age. Of 49 melancholia cases, 37 were above the general median in perseveration; of 8 manics, 7 were below the general median. Eight of 10 obsession cases were above the median in perseveration; 27 of 34 hysterics were below the median. Twenty-four of 30 delusional cases were in the middle quartile. Trait ratings showed no such clear correlations with "p." Persons (children or adults) rated as difficult and unreliable fell (75 percent) in the extreme quartiles of perseverance or non-perseverance. Persons rated as self-controlled and persistent fell (75 percent) in the central quartiles of the perseverance scale. Rogers (719) found correlations of .3 between perseverance and marks in reading, writing, and spelling; lower correlations with other subjects. Rangachar (715) used seven tests of perseveration to compare 38 Jewish and 35 English boys. The "p" scores of the Jewish group were higher in every comparison, but the differences were seldom statistically significant. Cattell (656) tried out eleven tests of perseveration, the more reliable of which had intercorrelations averaging .2. Correlations with factors of cleverness, will, maturity,

and adjustment, derived from ratings, were likewise negligible. Eight further tests including speed, reading comprehension, oscillation of ambiguous perspective, intelligence, and the psychogalvanic reflex showed no significant correlation with any of the other measures except for one result of .61 between speed of reading and the "c" factor (urgency). The concepts are elusive, the tests fragmentary, the results trivial.

Howells (683) studied persistence (not perseveration) with tests of ability to stand fatigue from holding a dynamometer, pain from pricking, heat from a grill, electric shock, pinching, and a blunt peg forced into the flesh. High scores on these tests tended to accompany willingness to endure pain for higher grades, volitional perseveration (Downey), ascendance (Allport), religious radicalism, masculinity, being the oldest child, leptosome build, and high academic grades. Wang's scale (743) for measuring persistence involves self-report on 101 direct questions. It correlates .5 with adjustment on the Thurstone scale.

"Suggestibility" is a name given to many psychologically distinct behaviors. L. W. Davis and Husband (663) studied the degree of trance which a subject developed under a standard hypnotic procedure, and found this unrelated to scores for Colgate introversion, fair-mindedness, and Pressey X-O affectivity. More intelligent and better adjusted men were more susceptible, but this relationship did not hold with women subjects. White (750) used ink-blots with and without suggested resemblances. Correlations among nursery-school children between suggestibility and I.Q. were -.40. Stevick (733) applied the progressive weight series as a test of suggestibility to 200 adults. Sixty-two percent showed no suggestibility and only 20 percent continued to imagine the increase for more than one step beyond the point where it ceased. Correlation of religious conformity and suggestibility was -.9. Bonte compared suggestibility of children when asked questions about a picture they had seen and about a staged alteration in the classroom. Eidetics were influenced in 36 percent of their answers about the picture, and in 93 percent of their answers about the incident. For non-eidetics the corresponding percents were 35 and 88. Platonov (713) suggested to three adults in hypnosis that they would awake and be only four, six, or ten years of age. They were then given Binet tests. The results show an extraordinary correspondence, the obtained M. A. being within one year of the suggested "regression age" in eight of the nine comparisons. Sherman and Crider described a case of hysteria in which a regressed patient wrote her name, drew pictures, and solved intelligence problems on the younger age level.

Williams (753) used Hull's test of forward or backward swaying in response to suggestion, and reputed catatonic and paranoid types of dementia praecox patients giving a negative response, the manics not responding at all.

The Wells Emotional Age Scale was revised by Weber and now contains problems of eight types: moral association, fear association, interest preference, interest association, collecting preference, blended emotions,

matching proverbs, expressing feeling, and emotional analogies. Retest reliability of each type, ranged from .33 to .75, for the whole test .78. Correlations with intelligence ranged from .27 to .78, for the whole test .80. Correlations with C. A. ranged from .20 to .61 with .71 for the whole test. Apparently the instrument is a sort of intelligence test. Correlation with ratings on emotional age was only .3.

Willoughby (755) worked out a scale with sixty short descriptions among which the rater chooses the appropriate one. Each has been judged to have a certain value on a scale of emotional maturity.

Physiological and Laboratory Tests

The most ingenious and promising advance in technic during the period under review was reported by Lasswell (689). He conducted portions of psychoanalyses, under conditions which permitted a record of everything said, of the patient's bodily movements, his pulse rate, and the electrical conductivity of the skin. Reflection on the probable correlations suggested that when the patient was speaking directly about the analyst, he would experience more effect and the pulse rate would probably increase. During periods of tension skin conductivity would increase but rate of speaking would decrease, and the reverse would be true during absence of tension. Formal check was made by studying pairs of days in which the second varied significantly along one of these lines, from the day preceding. Thus on 20 pairs of days showing increased pulse rate the second day, there was an average of nine more references to the analyst during the second interview. For the reverse pairs, with decreased pulse rate the next day, the references to the analyst decreased on the average by eleven. Similar confirmation of the other hypothesis was possible. This is clearly only a beginning of the interesting interpretations which may be expected from the abundant data.

Dysinger and Ruckmick (665) also used verbal, psychogalvanic, and pulse records in their study of the influence of moving pictures on 150 children and adults. Average P G R deflection for scenes of danger and conflict was 2.1 mm. for children, 1.8 mm. for adolescents, and 0.9 mm. for adults. For erotic scenes the deflections averaged 0.8 mm. at age nine, 1.0 mm. at age sixteen, and 0.3 mm. for adults. Repetition of the picture decreased the effect.

Nomura used time of delay in a learned reaction and number of errors in the reaction, as a measure of surprise-effect. Rowland suggested events, graded in their affective character, to hypnotized subjects, and showed a fair correlation between the judgment of emotional excitement and increased irregularity in a breathing curve. Luria's book (695) is an outstanding contribution, perhaps the most stimulating combination of theory and practice in this review. He conceives of a "functional barrier" which keeps conflict in the higher cerebral centers until a course of action is found in which the whole organism can be integrated. Premature emergence of the

conflict into the muscular system creates disorganized behavior. The functional barrier is weak in early childhood and in fatigue. Strong emotion may cause a short cut or overflow into the motor system giving impulsive or diffuse reactions. Luria developed and tested his theories in experiments involving word association, record of accompanying voluntary and involuntary movements, breathing curves, creation of artificial conflicts by hypnotic suggestion, tests requiring quick shift from one language to another, rhythmical motor reactions, tests involving choice among arbitrary alternatives and alternatives with associated cues, tests which seemed easy but quickly became impossibly difficult, voluntary motor action in cases with certain nervous disorders, drawings, and other symbolic surrogates. Unfortunately the book is poorly translated and so badly arranged that many readers give up before getting to the last few chapters which are the most important. Olson and Jones (707) followed up Luria's idea of disorganization of behavior in conflict situations. They proposed emotionally toned words and propositions (also control stimuli) to subjects for rapid associative reaction. A voice key indicated the time taken to respond, and simultaneously the subjects were supposed to press down keys with each hand. The emotionally toned material produced significantly more vigorous responses. Correlations with self-rankings were about .5; those with rankings by friends about .1.

Hersey (679) observed twelve workers for some 300 two-hour periods and estimated their emotional states. In positive moods (elated, happy, hopeful, cooperative, pleasant), production, objectively measured, averaged 102; during neutral moods (indifferent, excited, tense, mixed) 100; during negative moods (unpleasant, suspicious, peevish, angry, disgusted, sad, pessimistic, worried) production averaged 93. Averages were consistent in the case of each man. Hartenstein used introspective reports of mood for eight subjects given laboratory tests on different days. There was no convincing evidence of the effect of weather on efficiency, and the effect of mood varied with the individual.

Treatment

Rarely are tests reported as part of a total experimental process: test-treat-test. When more studies of this type develop, there will probably be more enthusiasm on the part of educators for personality measurement. McLaughlin (696) used the Allport Ascendancy-Submission Scale and ratings by associates with 400 college students, identified extreme cases, and then carried on a re-education through interviews, help from friends, selected readings, reports of analogous cases, correction of speech and other handicaps, and readjustment of environment. The test was not repeated after the training, but another set of ratings was secured from the same judges. Among 12 markedly ascendant students, only 5 appeared to have changed in the desired direction. Among 13 extremely submissive subjects, 12 showed improvement, 4 marked improvement. Laird and

others (688) selected 53 children who seemed, on the Olson Behavior Check List, to be unusually nervous. Diets directed toward building up calcium metabolism brought about demonstrable improvement over control, particularly in the group taking milk and a food concentrate at the middle of the morning. Fajans (667), in one of Lewin's impressive and valuable investigations, showed how ambition and perseverance could be built up. Experiments demonstrated a series in which the most powerful was success in an assigned task which appeared difficult, said success accompanied by encouragement. Success alone had more effect on future behavior than did praise alone.

Tests Related to Unconscious Reactions

Tendler (736) gave the Kent-Rosanoff Word Association Test to 50 psychoneurotics and made an unusually careful analysis of the types of response. Frequency score correlated with some of the types of association as follows: contrast, .67; similarity, .50; noun-adjective or adjective-noun, -.80. Individuality of response correlated -.3 with contrast, -.5 with similarity, .60 with adjective-noun or noun-adjective score. He proposed that association by contrast, superordination, and coordination be regarded as adult types; association by contiguity, adjective-noun, or noun-adjective as juvenile. In the Rosanoff frequency tables were 44 of the former and 16 of the latter. In the Woodrow-Lowell norms for children there were 11 of the adult type and 44 of the juvenile. McElwee found subnormal adolescents giving many more reactions of zero frequency than were given by normal children or adolescents. Copeland studied frequency of usage for 15 words and found unfamiliarity to correlate (ρ) with reaction time .7, failure to respond .9, with psychogalvanic reflex, zero. Fisher and Marrow suggested post-hypnotic moods of elation and depression, with a result that word associations were slowest in the depressed mood and fastest in a normal state. This was true whether stimuli were supposed to be pleasant, unpleasant, or neutral.

The Schwartz social situation pictures are drawings of children in situations in which delinquency seems imminent (724). They are supposed to be used in supplementing other forms of examination to get beneath the surface with delinquent boys.

The Rorschach Test was used in more than a score of studies published during the past two or three years. Hertz's recent review (681) of Rorschach literature contains 152 items. The popularity of this test arises in part from the fact that it is almost unique in approaching personality as a whole rather than atomistically. A two-volume edition (721) of Rorschach's original study, supplemented by two other articles, appeared in 1932. English descriptions of the test have been written by Beck (640) and Vernon (740). Variations of the original blots have been used by Behn-Eschenberg, Roemer, and Gordon and Norman. Loosli-Usteri and Vernon have published suggested improvements in technic of administration. Hertz

(681) summarized reports of reliability, found most of them low, and proposed a standard procedure which raised most of the measures above .6. Norms are inadequate and there has been some controversy about the necessity for age norms. Loosli-Usteri (693) found few movement responses among children nine to fourteen. Bleuler (648) found siblings more alike than are unrelated subjects, and Verschuer (741) found monozygotic twins more alike in Rorschach measures than are fraternal twins. Vernon (740) found some correlation with artistic aptitude. Hertz (680) found color response highly correlated with ascendancy and movement responses with submission. Color response was similarly indicative, in her studies, of Woodworth-Mathews symptom score. Wertham and Bleuler (748) used the test before and after taking the drug mescaline, with resulting evidences for change in personality. Levy and Beck (691) tested patients during a manic attack and after recovery. Recovery was indicated by increase in number of replies, decrease in color responses, decrease in originals, and increase in responses determined by form. Oberholzer used the test to aid in differential diagnosis of skull injuries. Meltzer (703) reported results on stutterers. Beck (640) found mental age among the feeble-minded, correlated with excellence of form perception .6, and with tendency to interpret the picture as a whole, .5. Hertz's results (680) were in agreement: .5 for superior form answers; but he disagreed on the significance of wholes and added a significant correlation (.4) with original answers and a negative relation (-.4) with oligophrenic details. Beck (641) in another study found agreement between the Rorschach analysis and clinical studies in 33 out of 37 cases.

Wolff (757) recorded the voice, hands, profile, and free recall of a story, for each of his subjects. Later each subject was asked to identify others' and his own. He discovered that errors were in the direction of approach toward the subject's ideal of himself as he would like to be.

Typology

With the increasing trend toward organismic thinking and the consequent necessity to try to study the personality in its unitary, integrated form rather than in elements like traits, there has come increasing attention to characterology and typology.

The best verified typological difference is that which takes extreme form in the commonly accepted categories of psychosis. The schizophrenic differs from the cyclic manic-depressive, and a similar difference can be observed within the normal population between schizothymes or schizoids, and cyclothymes or cycloids. Bowman and Raymond (649), Bigelow (646), and Faver (668) have described the pre-psychotic schizoid as seclusive, irritable, oversensitive, anal-erotic, narcissistic, feeling insufficient, etc. Small-don (726) described the cycloid as pyknic, voluble, hyperactive, extroverted. Eyrich (666) found less similarity among epileptics, but proposed three typical syndromes which the Rorschach test helped to identify: (a)

retardation, impoverishment, inelasticity of mental life; (b) vain and egocentric oversensitiveness and irritability; and (c) restless activity, distractibility, tension, but absence of feeling. Willemse (752) used case studies, letters, laboratory performance, Rorschach tests, drawings, physical measures, etc., in studying adolescent delinquent boys. He agreed with Kretschmer's thesis that the boys with leptosomic build lacked energy, were timid, easily influenced, solitary, self-conscious, with silent scheming and sexual maladjustment. The pyknics might be sociable optimists, or querulous choleric, or undaunted adventurers. Humm and Wadsworth (684) standardized a scale for normal, hysteroid, cycloid, schizoid, and epileptoid components in temperament. Burkersrode and Ille (650) used self-ratings, ratings of others, tests of attention type, flexibility, form and color influence, etc., in confirming the Kretschmer typology. Watson (746) reviewed German psychology and summarized results from about 8,000 cases, in which 50 percent of the schizophrenics were leptosomes, while 65 percent of the cyclics were pyknics. Revesz (717) listed eleven types largely derived from psychopathology.

Pavlov and his followers have distinguished four types: inhibited, excitable, labile, and inert. Khozak (686) added a few intermediate types as a result of three conditioning experiments with each of fourteen children.

Two recent books can be added to those giving fairly comprehensive reviews of typology, one in German by Rohrer (720) and one in Rumanian by Todoranu (737). The latter emphasizes activity, emotivity, and psychic force or intensity as the central variables in temperament. His tests lead him to believe that two major types in accord with Kretschmer's thesis can be identified. Heymans and Wiersma were among the first to collect extensive ratings on character. Wiersma (751) recently published the distinguishing characteristics of some 80 persons (among their 2,500) who were described as persistent liars. They were rated as emotional rather than non-emotional, inactive rather than active, and dominated by primary function, i.e., absence of perseveration. This combination makes the "nervous" type. Only one was described as continually industrious; the liars were usually said to be lazy, violent, fond of variety, repeatedly changing their occupation, and very vain.

Beck (638, 639) from his experience with the Rorschach test has tried to build a typology around four variables: form perception, organizing energy, affective drive, and creative ability. The interaction of these with the particular environment determines the personality.

Psychoses

Development of a psychosis is an extreme giving indisputable evidence of personality maladjustment. Reference has been made in several of the preceding studies to the use of psychotic groups in the validation of instruments.

Mason (701) used commitment to a mental hospital as an index of emotional adjustment among teachers, and studied 700 such cases. As

compared with the classifications from the general population, the teachers showed fewer cases of general paralysis, alcoholism, and epilepsy, but more cyclic and paranoid psychoses. In heredity likewise these teachers showed a large proportion of functional disorders. Among the teachers 77 percent were single, while in the general population of the state hospitals only about half that many are single. Economic conditions of the teachers were superior to those of the unselected cases. Contributing causes present in 10 percent or more of the cases included: venereal disease, worry over the possibility of venereal disease, sex conflicts, excessive masturbation, poor health, and school troubles. Only 4 percent of the men reported interests in sport, dancing, theater, music, or travel. Reading, study, and religion were the common interests. About 60 percent of the cases were regarded by friends as sensitive, shy, and seclusive. Two-thirds were graduates of normal schools or colleges.

Comment

The chaos of theory in relation to emotional growth, neuroses, psychoses, and psychotherapy seems to have resulted in many deplorable superficial investigations. It seems easy to buy a printed blank, count the answers, and compare one group with another. This type of study avoids coming to grips with any of the genuine issues. The most urgent need in this area of study, is the development and use of measures by persons who are experienced in the clinic, who are thoroughly conversant with the doctrines of the neurologists, of Freud, Adler, Jung, and their successors, and who are at work on some of the basic problems. Sound measurement technics cannot develop faster than clear thinking and crucial experiments concerning the nature of the phenomena to be measured.

CHAPTER VII

Social Attitudes

Social Behavior

WHILE psychologists were carrying on the studies of social attitudes reported in this chapter, our national income tumbled to half its former size and unemployment rose to include at least one-fourth of the workers of the country. Political leaders together with many writers of editorials and magazine articles expressed a conviction that basic changes were taking place in the attitudes of the American people. The most interesting fact in this review of research is that a reader going through the more than two hundred scientific studies would find very few attempts to describe or to interpret any aspect of this social situation.

Due to limitations of space studies deemed less important (about half as many as those here mentioned) have been omitted entirely.

One study, Almond and Lasswell's comparison (760) of docile versus aggressive personalities among the recipients of relief, did bear directly on the present scene and the forces at work creating attitudes. There has been much speculation as to the class or group which will furnish the drive toward a new society. Lasswell compared 100 aggressive clients and 100 submissive clients, and found the aggressive to have had a year longer on the relief rolls, to have held more political jobs in the past, and to have had more arrests for various offenses. Among the aggressive he also found a larger proportion who married outside their national and religious group, a larger proportion whose occupations dealt primarily with persons rather than things, a larger proportion from dangerous occupations, more shifts in occupations, more trade union members, more education, larger incomes, and the payment of higher rentals. The aggressive averaged nearly ten years younger, were more largely a native-born group from the surrounding region, were much more predominantly urban, were less likely to own their own homes or any other real property, and were slightly more apt to show physical or neurotic handicaps.

Baker (766) studied race attitudes using primary historical sources (newspaper clippings, magazine articles, files of correspondence of organizations concerned, interviews with participants, visits to the scene of action, etc.) and concerned himself particularly with the relative effectiveness of ten organizations which have been active in attempting to attain justice and equality for the negro race. An incidental portion of his study included questionnaire responses from 200 people who had changed their attitude. The opinions pointed to personal contacts with negroes, and participation in interracial projects as major influences. Baker identified two

broad types of goal (bi-racial versus amalgamation) and two broad types of method (conference versus force). The immediate trend appears to be an increasing use of force by groups working toward both types of goal.

Lasswell and Baker were almost unique among those reviewed in this chapter in deriving their measures of attitude from overt behavior rather than from verbal expressions on a questionnaire or scale. Kelley and Krey (812) in their volume of investigation under the auspices of the Commission on the Social Studies of the American Historical Association attempted with Thurstone's help to construct an attitude test for junior high-school children. They listed six basic difficulties which led them to give up their attempt to use such scales, and which apply in some degree to nearly all of the studies dealt with in this chapter:

1. Administrators were afraid to permit the use of tests which even suggested markedly unconventional positions.

2. Pupils did not understand the terms and concepts. It was impossible to know from their checked response what they had really understood by the proposition.

3. Attitudes vary in depth, stability, and permanence, and the scale responses give no clue as to these differences.

4. Most people are reluctant to tell what they think about important issues except under rare conditions of exceptional confidence. "Only the most rabid partisans are willing to divulge their attitudes freely, and for such no test is necessary." Children in school are apt to protect themselves by answering what they think is expected; adults by refusing to answer the questionnaires.

5. There is sometimes a tendency toward compensation. The person lax in conduct may try, consciously or unconsciously, to make up for this by extreme verbal condemnation of such behavior.

6. Many of the answers were superficial snap-judgments, given rather to oblige the questioner than because of any independent attitude on the part of the subject tested.

Kelley and Krey reviewed various methods for ascertaining attitudes and concluded: "The new-type test is most direct and perhaps, therefore, least efficient." The historian's comparison of words and acts they would rate first, but would put essays, interpreted by the teacher, ahead of scales and blanks. The Commission as a whole concluded in their summary volume (761) that results must be tested "not in the classroom by teachers, but in the arena of social and political life and by the long sweep of history." In another chapter, written for but not included in the report, Horn and Lindquist (802) recognized many limitations, but concluded that if attitude scales were used for description rather than for the evaluation of attitudes, and were used only in situations in which the testee had no incentive to conceal his true attitude, that they offered excellent possibilities. These authors observed that progress in scale construction could not go far without better definition of educational objectives in terms of general emotionalized attitudes, and more authoritative description of the specific situations in which attitudes should find expression. Other reviews, less critical and more in the nature of summaries, have been made by Sherman (845), Droba (785), and Fujibayashi.

Changing Attitudes

Especially in a society which suffers from the lag of social attitudes behind mechanical progress, it is important to investigate how attitudes can be changed. Cherrington (779) gave the Heber Harper Test of International Attitudes to nine groups before and after various types of study program. All except one (adult women, average age 50, widely travelled, from well-to-do homes, meeting weekly) showed movement toward a more international outlook. College classes in international relations showed considerable gains, but a seminar of advanced students working at Geneva, Switzerland, under some of the world's most eminent instructors showed little "gain" in test score. Undoubtedly they gained much from the experience, but sudden immersion in the intricacies of international questions shattered some of the liberal attitudes they had brought with them, and left the students more hesitant about expressing any judgment. Eight other groups were tested for attitudes toward war and disarmament before and after periods of lecture, seminar, institute, etc. Little change was found in groups which had gone through many hours of lecture, study, and discussion, but very marked changes were found in two groups subjected to brief but powerful appeals. One of these latter heard Kirby Page give an address condemning war; the other read the Eddy-Page pamphlet *The Abolition of War*. After twenty-four hours the group who heard the speech showed a shift 10 times its P. E., and those who read the pamphlet a shift 7 times its P. E. Retest after six months showed that the change had shrunk to about half its former size, but was still significantly (4 or 5 P. E.) different from the initial score. After some months of preparation, a group of representatives from several colleges met in a model disarmament conference, preceding the actual world conference. Students were assigned to represent as faithfully as possible the attitudes of some participant country. Commissions like those on the draft convention were set up. Professors were on hand to act as consultants, but there was much emphasis on student initiative. The conference met for two days in the state capitol building at Denver. Participants, 116 in number, were listed before and after the conference, using the Thurstone Attitude toward War Test and a new test, devised by Cherrington, using the Thurstone technic, on Attitude toward Disarmament. Differences were only about twice their P. E. and did not vary significantly from a control group, similar in age, sex, and college year, but who had no connection with the model disarmament conference.

Biddle (769) tested the ability of students to recognize typical propaganda tricks and found that a course of ten lessons which was prepared to expose these methods produced significant gain in ability to recognize and to discount them, even in changed content. He reported a correlation of $-.36$ between knowledge about international relations and susceptibility to articles appealing to prejudice. Peterson and Thurstone (833) showed that motion pictures influenced attitudes (as checked on a printed scale)

toward race, nationality, crime, war, punishment, and prohibition. The changes persisted over months. De Feo (780) found that the commercially exhibited war pictures shown to 15,000 Italian children had the effect of glorifying war, and instilling a sense of patriotic duty to fight for one's country. Shuttleworth and May (847) verified the hypothesis that movie-going children valued clothes as an aid to popularity more than did children who attended infrequently. Most of the obtained differences were explained by these investigators as due to selection of group rather than influence of the movies. Vincent (861) found about half of 200 adults convinced that the theater had influenced their attitudes toward social problems. Robinson (839) tested 400 adults before and after radio talks on unemployment. As compared with a control group, the radio audience had more suggestions for decreasing unemployment (particularly via unemployment insurance), and showed a decrease in the proportion of statements rated as doubtful. Chên (778) tried out brief speeches (pro-Japanese, pro-Chinese, or neutral-factual) on Manchuria and on Oriental art. He found each type of material effective with persons originally at any position on the scale. Marple (824) obtained further data on the comparative influence of majority opinion and expert opinion, finding, as did previous investigators, that knowledge of what one's group thinks or knowledge of what authorities answer, brings about marked tendency to agree with such influences. In this case group opinion seemed somewhat more effective than the opinion of the experts. Marple added the factor of age, finding the greatest susceptibility among 300 high-school seniors, a middle position for 300 college seniors, and least susceptibility among 300 adults averaging 40 years of age. Kulp (817) found students of education more responsive to the prestige influence of liberal educational authorities than to the similarly offered answers of liberal laymen or liberal experts in the social sciences. A retest eight weeks later, using simply the Harper questions and no report of answers by experts, showed that the prestige influence was still effective on 90 percent of the changed items. Kroll (816) applied the Harper test to six twelfth-grade classes in February and again in June to compare the influence of conservative and liberal teachers. Of the three conservative teachers one had an influence clearly in the liberal direction, another probably slightly in this direction, and the third teacher's class showed no change in attitude. The three liberal teachers all exercised very strong influence in the liberal direction. (Probably some of the apparently "liberal" change should have been attributed to the content of the course of study.) There is apparently a tendency for college students to shift toward liberalism on the Harper test in the transition from the freshman to the graduate year. Boldt and Stroud (772) also found that liberalism tended to be associated with the number of hours of work taken in the social sciences. The data were interpreted to show the influence for college attendance and types of courses. Annis and Kirkpatrick found "planted" content in college papers influential. Campbell, Droba, Salner, and others reported that students are influenced in a liberal direction by liberal courses in college.

Jack (808) used an interview technic before and after a four-month course in parent education. Differences on the whole were slight, but as might have been expected, those who were most backward at the beginning made larger gains.

Correlates of Social Attitudes

Another type of study, less direct and convincing, is based upon the correlation of differences in attitude with other observed differences. Thus Kulp and Davidson (818) found siblings alike in attitudes on international relations to the extent indicated by a correlation of about .3. Wrightstone (870) constructed a test of liberalism on race and international and politico-national questions, which was administered to about 400 pupils. Liberalism was correlated with historical knowledge (.58), number of periodicals read (.37), socio-economic status (.28), number of courses in the social studies (.19), verbal intelligence (.11), emotional stability (.08), and masculinity. Harris, Remmers, and Ellison (798) used Harper's Social Study Test with about 300 students at Purdue. Liberalism, in their findings, was correlated with intelligence (.29 for men, .09 for women), with self-estimates of liberalism (.3 to .4), with never going to church (-.65), with absence of religious preference, belief in evolution, independent political affiliation, with the study of sociology, and with masculinity. Whitaker (866) constructed tests of opinion about government and capital and labor for 600 high-school pupils. Rural groups, compared with town and city pupils, seemed most strongly devoted to the present government, also to favor labor rather than capital.

Carlson (775) found a correlation of only .21 between scores for information and self-rating on the certainty with which opinions about presidential candidates (1928) were held. Intelligence had zero correlation with general certainty, but a correlation of .28 with information. Men were much better informed and slightly more certain than women. Graduate students were least inclined to assert positive certainty; freshmen were most poorly informed.

Vevecika (859) found no correlation between social attitudes of children expressed in a questionnaire, and observations of their social behavior. These social attitudes were likewise unrelated to intelligence.

Heber Harper's extensive questionnaire on international relations presenting 352 questions on twelve themes, is outstanding because of the scholarship behind the statements. Few attitude tests have been prepared or criticized by persons of superior competence in the subjectmatter concerned. Harper (797) compared results from 1,700 students in eighteen universities in eight countries. International organization was most popular among the students in France and England, least trusted by those of Austria. Nationalism was no more prevalent in Germany than in the United States. Psychology students were less likely than were students in other fields to believe war a necessary institution. Kolstad (814) examined in more detail 500 Harper blanks filled out by American students and found

liberal international attitudes correlated with: intelligence (.19); masculinity; a major in history or educational administration rather than one in nursing, physical education, or household arts; more advanced degrees; graduation before 1918; travel abroad; independent political affiliation; residence in the West North Central region rather than in the South Atlantic; and affiliation with Congregationalists rather than Lutherans. Droba presented his study of militarist-pacifist attitudes in several articles in addition to the one included in the bibliography (784). He found pacifist attitudes among students at the University of Chicago correlated with: age, femininity, social-science study, independent or socialist political affiliation, liberal Protestantism rather than Lutheranism or Roman Catholicism, absence of military service, foreign parentage, and academic scholarship. No relation was found between response to his scale and intelligence, education of parents, occupation of father, or nervous symptoms, as reported on a questionnaire.

Race attitudes were studied by Guilford (795) using paired comparison of 15 "racial" (really primarily national) groups, in seven universities. Students at New York University differed distinctly from those in other schools. The nationality of the students' parents was related to favor for that group. Zeligs and Hendrickson (872) used a type of Bogardus social-distance scale to study the attitudes of 200 sixth-grade children toward 39 "races" (again, nationalities). Correlations between attitudes of boys and girls, Jewish and non-Jewish, were .85 or above. Acquaintanceship made for tolerance in all cases except the negro. Garrison and Burch (791) used 35 true-false statements on negro-white relations, chosen from the questionnaire prepared by the Social Science Research Council Committee. Less than half of the students at North Carolina State College accepted such a statement as, "The principles of brotherhood should hold in relationships with negroes." Freshmen were more intolerant than seniors, and students from rural communities more intolerant than those from urban centers. Reckless and Bringen (836) used 40 statements from C. S. Johnson's questionnaire on racial opinions to compare with results on 40 information items. Correlations between information and attitude favorable to the negro were .88 in the South, .58 in the North and West. Minard (827) found race attitudes fairly well defined by seventh grade, and always far below what experts deemed desirable. Intelligence was conducive to better race attitudes, but these attitudes showed little relation to sex or to socioeconomic level within Iowa towns.

An unhappily large number of studies not reported here dealt simply with the attitudes of some college class on a set of opinion statements, or compared results among various college classes. In general, college training appears to have some liberalizing effect, although the proportion preferring Fascism to Bolshevism in Willoughby's study (867) of Stanford University students rose from 60 percent of the freshmen to 75 percent of the seniors. Moore and Garrison (829) pointed out that A students made 53 percent of the possible radical choices and none of the re-

actionary sort, while D students made only 4 percent of the possible radical choices and 13 percent of the reactionary ones. Conservatives and reactionaries were relatively more frequent in North Carolina State College, less so in Washington State College, and least in evidence at New York University. Stalnaker (850) made a Thurstone scale on attitudes toward athletics and reported athletes most favorable, college administrators least so.

While no studies dealt directly with the attitudes of owning classes versus working classes, Arnett (764), in addition to reporting the general conservatism of 1,076 schoolboard members taking the Manly Harper Social Belief and Attitude Test, analyzed results by vocational and other categories. The most conservative were those in clerical, proprietorial, and managerial occupations; the most liberal were the professional workers. Age seemed to make relatively little difference except that those from sixty-one to sixty-five years of age were markedly more liberal than those younger or older. Liberalism increased generally for those with more than thirteen years of schooling. Independents in politics, were, of course, more liberal than Democrats, and much more liberal than Republicans. Sex differences, sectional differences, and differences due to size of community were slight, except that those from cities over 50,000 appeared more liberal. Uhrbrock (857) constructed (Thurstone technic) a scale of attitudes toward the company, and administered it to 4,430 employees under conditions assuring them that their frank and anonymous opinion was desired. Most favorable were the foremen, 86 percent of whom exceeded the mean of the factory workers. Next came the office clerks, 77 percent of whom were better satisfied than was the average factory hand. Correlation between attitude toward the company and information about the company was $-.01$; correlation of attitude with intelligence was $-.14$.

Grauer (794) tested job satisfaction, mechanical performance, and rate among sewing-machine operators. Attitudes toward the tests were rated by examiners. Earnings correlated $.67$ with the performance tests, $.42$ with favorable attitudes toward the tests, and $.33$ with job satisfaction. Hall (796) gave a questionnaire designed to give measures of occupational morale, attitude toward employers, and attitude toward religion, to 360 unemployed and 300 employed engineers. Employed men were more ambitious and favorable in their attitudes toward engineering as a profession, and were also more appreciative of employers. Favor toward employers among the employed men increased with age. Bitterness toward both job and employer increased with increasing period of unemployment and with financial desperation of the unemployed men. There were clear differences between the employed engineers who felt secure in their jobs and those who feared a lay-off, the latter approximating the attitude of the unemployed. Kornhauser and Sharp (815) used questionnaires and interviews to obtain attitudes regarding work from 200 factory girls. Two departments, identical except for having different forewomen, showed in one case 71 percent of the girls favorable toward their job, in the other

case only 29 percent. Sixteen of the 25 most neurotic were dissatisfied; only 3 of the best adjusted emotionally were similarly dissatisfied. Equal pay for all was favored by 75 percent of those with low efficiency records and by 36 percent of those with high efficiency records.

Interesting studies have been made of differences in attitude among racial and national groups. Gardner (790) found negroes no more different from whites in association tests than two white groups were from each other. Shores (846) found correlations of .82 between the non-fiction reading interests of negro students at Fisk University and white students at the University of Chicago. Sex differences were greater than race differences. Pressey and Pressey (835) gave his test of emotional attitudes and interests to nearly 2,000 white children and an equal number of Indian children above fifth grade. By white norms, the Indians showed retardation of two to five years in emotional age. Chant and Freedman (777) reported Canadian and Chicago students alike in nationality preferences. Thomson (856) showed a picture designed to arouse sympathy, to about 50 each of German, Esthonian, and Russian young people. Subjects reacted by reporting emotions felt, by drawing lines unconsciously, by giving color reactions, by telling what action they would take, etc. The most expressive (perhaps partly due to the conduct of the experiment in the German language) were Germans, next Russians, least Esthonians. Boys were more expressive than girls. Köhler (813) reported cultural differences in his statement that attitude scales would be little used in Germany because Germans objected to being questioned about such personal matters. Madden and Hollingworth (822) found white judges and Chinese judges to use different standards in judging the beauty of white adolescents.

Lewerenz (820) gave his Questionnaire Orientation Test, which is concerned with opinions about health, education, leisure, home life, culture, etc., to juvenile delinquents, adult prisoners, policemen, and superior adults, finding the average scores to increase in the order named, with the last group much superior to the other three. Hendrickson (799) compared 87 sophomores in a teachers college with a group of experienced women teachers and found the latter to be: older, less interested in dances and other social activities, less interested in light entertainment, less inclined to physical exercise, more apt to go to concerts or to visit art galleries, and more interested in stocks and bonds.

Attitudes differ not only among racial, national, and occupational groups, but change over a period of time within any given group or section of society. Bain (765) found that the mental hygiene approach had so permeated popular thought that incoming students in 1932 agreed much more closely with Wickman's mental hygienists than did corresponding groups in 1927. Acheson found deans of women reporting considerable liberalization in their attitudes. Montelli (828) used the technic of asking, "What would you do if you had a magic cap?" to show how much more practical, concrete, and social are the interests of Russian youth today than

were the sentiments expressed before the revolution. Schank (840) analyzed two changes in rural community attitudes, one in which vested interests developed sentiment for a particular site for a consolidated school, and another in which private attitudes toward baptism and card playing triumphed over the previously maintained publicly acceptable stand.

Moral Values and Religious Attitudes

Among the twenty-five studies of moral and religious attitudes, the most numerous were Dudycha's detailed reports (787) on student beliefs in religious doctrines, superstitions, social and moral problems, evolution, etc. Binnewies (770) tested religious beliefs before and after eight lectures which succeeded in bringing about a marked shift toward liberalism. Betts, Clem and Smith, Durea and Simpson used the old technic of getting names of types of offenses ranked in order of badness, with the outcome no more illuminating than has usually been the case.

Since Wickman's original study of the seriousness with which teachers as contrasted with mental hygienists rated various offenses, several others have used a similar technic: Stogdill (853) compared ratings by parents, students, and mental hygienists. Watson (863) showed that the mental hygienists did not agree among themselves any better than the teachers or parents agreed with them, that the offenses were stated too vaguely and generally to make possible any reliable rating or valid interpretation, and that the questions given to the two groups were not really comparable. He argued that such studies showed only that either group, both groups, or neither group may be right. Mathews (825) asked 500 students and 50 faculty members which of several described cheating incidents they could justify. Laxer standards appeared to prevail among students, men and upper classes. Schneckenburger (842) compared attitudes of children from proletarian homes with attitudes of children of similar age from middleclass or bourgeois background. No differences appeared in reactions to pictures of boys (a) attacking a girl or (b) sticking a sleeping grandfather with a pin; but on (c) a picture of a thug clubbing a rich man, the testimony (oral) of the proletarian children showed 28 percent approving and 15 percent excusing, while among the bourgeois children only 10 percent approved and none suggested excuses. Schmeing's questionnaire (841) on negative ideals among 1,000 school children showed the importance of studying not only what children seek, but equally what they wish to avoid, e. g., contempt of their fellows, unemployment, or illness.

A new approach to the problem of moral knowledge, and one which might well be adapted to other problems, was worked out by Yates (871). He analyzed 150 suits for slander and developed the accepted principles. On the basis of these principles he constructed a questionnaire for children, revealing the areas in which they needed instruction.

Gilliland (792) used 40 statements supposed to test superstition after a psychology course and found an average reduction from about ten errors to six errors. Whitelaw and Laslett (865) gave the Nixon list of superstition statements to their classes. Caldwell and Lundeen (773) reported extensive studies of superstition among secondary-school pupils.

The Allport-Vernon Scale of Values, based on the six types suggested by Spranger, was further tried out by Cantril and Allport (774) on 2,755 persons. Reliabilities appear satisfactory except for "social" value. Graphologists' rating for esthetic value correlated .4 with the test indication; ratings on economic value (.3), and theoretic (.25) were also indicative of some relationship, but the other lines measured showed no agreement. Pintner (834) found students majority in mental testing rating higher on esthetic, lower on political, and in the case of the men, higher on theoretical, values than were the A-V norms. Men in administration appeared low on esthetic value. Intelligence correlated .4 with social values, .2 with theoretical values, and -.4 with economic values. Class marks were similarly related positively to social values and negatively to economic values. Self-ratings varied from .68 for religious values to -.02 for political values. Attitude toward the church (Thurstone scale) correlated -.78 with religious values as measured on the Allport-Vernon Scale.

The most comprehensive analysis of religious attitudes, published during the period of this review is Woodward's attempt (869) to correlate adult religious views with childhood emotional development. Conservative religious attitudes were found among those who had grown up in religious homes, had experienced strong sense of guilt and sex shame, had not rebelled against home discipline, had experienced cooperation and companionship in the family, and had been dependent on parents. Vetter and Green (860) found members of the Association for the Advancement of Atheism typically to have grown up in a strictly religious home, to have left the church during adolescence, to have been unhappy in childhood, to have lived in cities over 25,000 population, and to attribute their atheism to wide reading and disgust with religious hypocrisy.

Donnelly (782) developed a test for high-school students to measure faith in God. Part I was a vocabulary test to make sure of adequate understanding. Part II contained twelve items concerning conduct, with opportunity to indicate how much conduct would probably be influenced by faith in God. Part III consisted of statements showing tendency to trust in God. These were scaled by 120 judges. Part IV consisted of statements of belief about God, more intellectual in form. Reliabilities were .68, .72, .48, and .83 for each of the four parts; .88 for the total test. A study of Jewish students was made by Nathan (830). About 60 percent reported impersonal concepts (including naturalism, skepticism, and agnosticism) of God, while 33 percent more nearly approached the orthodox personal concept. The proportion in these groups was unrelated to extent or type of religious instruction previously given.

Interests: General and Vocational

Katz, Allport, and Jenness (811) asked over 4,000 college students their attitudes toward study, social life, fraternities, instructors, religion, music, athletics, academic freedom, personal problems, cheating, and many other matters. The results have been published, but hardly lend themselves to summary. Sheldon (844) reported on vocational, recreational, service, and home interest activities of 1,087 boys and girls in the upper grades. Hildreth (800) studied preferences of over 200 adolescents for games, companions, school activities, reading, and vocations. Interests of Chinese youths were studied by Stowe (854), Chang (776), and Webster (864). Denisov (781) studied interests of upper-grade children in the Soviet Union and Antipoff (762) asked ten "preference" questions of 760 pupils ten to fourteen years of age in Bello Horizonte, Brazil. Drake (783) tried out an interest test and the Pressey X-O in a fruitless endeavor to improve prediction of college scholarship. Thomas (855) compared interests of public school and detention school boys, finding delinquents more likely to read Hearst newspapers, less likely to use libraries, more frequent in movie attendance, less apt to have a radio at home, but differing little in preferences as to games and active recreation. Reading interests were studied in the Soviet Union by Ivanov (807) and among 25 negro women by Hudson (803). Witty and Lehman (868) found rural children making more collections than did city children. Jones and Conrad (809) reported that country people liked action movies, especially "Westerns."

Fryer (788) has published a thorough review of interest studies, and also a suggestion (789) of five ways (control samples, selection of samples, group differences, extraneous criteria, and use) of validating interest measures. Schuwerack (843) used the device of asking young adolescents what they would do if they should suddenly become rich. Investment with a view to practical returns, provision of security for loved ones, and foreign travel were the majority types of response. Hildreth, Illge, Jones, and Wallace have published questionnaires to inventory interests.

Hurlock and Jansing (804) asked 1,132 boys and girls, age fourteen to eighteen, negro and white, concerning the vocation they would like most to follow, the one they are most likely to follow, and the vocation their parents would wish. Negro boys chose teacher, civil service, and machinist; white boys chose aviator and engineer. Negro girls chose teaching almost exclusively, while for white girls teaching rated below business. Over three-fourths of the pupils chose occupations other than those of their parents. Vampa (858) reported on the use of a questionnaire together with tests of attention and memory, as a means for constructing profiles which aided in the vocational guidance of 120 Italian boys. Lehman and Witty (819) found pupils most apt to choose the occupation they had rated as a good money-maker, next to choose the one they thought of as most respected, and least apt to choose the one they thought of as easiest. Proportions choosing by money and esteem were greatest at age twelve;

those choosing by ease were the youngest group studied (age eight). From their study of play interests, cited in the previous *Review of Educational Research*, Lehman and Witty compared vocational interests at various ages and showed that such interests cannot be permanent. Thus boys choosing certain types of engineering ranged from 3 percent at ages eight and nine to 23 percent at about age sixteen. Maller (823) studied the Edison scholarship candidates, as compared with other high-school students, finding the Edison scholarship boys: more apt to come from homes of workers, farmers, and professional men, less apt to come from commercial occupations; more apt to have scientists in the family; more apt to own scientific apparatus; more apt to intend going to college; just like the others in the hours given to sleep, work, and recreation; more apt to choose engineering as a vocation, swimming as recreation, and experimentation as a hobby. The Edison scholars were almost twice as apt to believe present relations between capital and labor satisfactory (86 percent to 37 percent and 51 percent in two control groups).

Goodfellow (793) used the Strong Vocational Interest Test with prospective teachers and compared the A (possessing interests of successful teachers) and the C (not possessing such interests) groups. The A group were superior in academic average. The 18 A women were less introverted (Colgate), less emotional (Thurstone), more ascendant (Allport). Personality differences with the 12 men were not reliable.

Other New Tests

The following may be added to scales and tests mentioned in connection with specific projects:

Beyle (768): scale for measuring attitude toward candidates for elective governmental office.

Beyle and Parratt (767): scale for measuring severity of the third degree.

Israeli (806): measurement of judgments about the future.

Nystrom (831): measurement of Filipino attitudes toward America.

Remmers, Brandenburg, and Gillespie (838): measurement of attitudes toward the high school.

H. N. Smith (848): scale for measuring attitudes toward Prohibition.

Stauter and Hunting (851) tried out a test of social contacts based upon questionnaire asking for the number of persons in each of 191 categories (e. g., baseball fans, art students, Methodists, Frenchmen, etc.) who are known by name and who know the subject by name. Correlations with intelligence, psychology grades, and ability to associate pictured faces with names, were all low. Those mentioned in the college newspaper scored higher than those never so mentioned.

Stevick (852) tested conformity by asking subjects to encircle first what they believed, later what they thought most people believed. The more schooled were slightly more independent in belief ($r = .25$).

Katz and Braly (810) asked 100 students to select from a list of 84 adjectives the five which the students considered most characteristic of

each of ten national or racial groups. In the case of negroes, 50 percent of the 500 votes cast were confined to five traits. The Chinese and Turks required twelve and sixteen traits respectively to include 50 percent of the poll, indicating less of the adjective-stereotype.

Israeli (805) found it interesting to ask students to predict divorce rates for years to come, and to give the most probable date for the decline of the West as described by Spengler.

Contributions to Technic

In his review of 125 titles on measuring attitudes, Droba (785) classified methods as: absolute ranking, case method, relative ranking, graphic rating, paired comparison, and the scale of equal-appearing intervals.

It has become accepted as good technic in making attitude scales to use Thurstone's method of equal-appearing intervals. Statements are sorted into piles (usually eleven) by judges. Statements which appear consistently in a given position may be chosen as representative of that degree of the attitude. The scale value of each statement is calculated. Hinckley (801) showed that statements on the negro were given approximately equal scale value whether sorted by northern or southern, white or negro judges. Wang (862) suggested sixteen criteria for the original selection of statements. Miller (826) criticized the Thurstone scale, because he found that the average person checked items ranging over 7.2-scale units while the scale itself had only 10.8 units in its entire range. He held that it is not justifiable to stop with the opinions of the original judges, but maintained that the actual responses of large voting populations should be used further to refine the scale.

The Bogardus Social Distance Scale (771) was built after asking 100 judges to distribute 60 statements indicating degrees of intimacy or social relationship into seven piles. Seven equidistant statements of situations were thus selected. Lists of 40 races, 30 occupations, and 30 religions have been prepared, with suitable instructions. Each is judged by whether people of that kind would be admitted to marriage, friendship, work, neighborhood, acquaintanceship, or citizenship. Zeligs and Hendrickson found nearly 90 percent agreement between the scale and personal interviews with 13 sixth-grade children. M. Smith (849) determined intimacy scale values for 16 statements of social distance as judged by 65 college students.

The question of the number of degrees of acceptance or rejection has been often argued and sometimes investigated. Pemberton (832) found the + 3 to - 3 scale the most reliable. Likert (821) in a careful study of attitudes on internationalism (24 statements), the negro (15 statements), and imperialism (12 statements) used some three point, some five degree, and some multiple choice responses. He found that the determination of sigma values for each of the five possible answers did not greatly improve reliability as compared with the simple method of counting 1 for the answer at one extreme, 2 for the next, 3 for the middle answer, then 4, and 5 at the far extremes. Reliabilities (split halves) varied from .80 to

.90, and retest after 30 days gave results just as high. Reliability of the Thurstone-Droba War Scale, scored by Likert's simple 1-5 method proved somewhat higher than when the regular Thurstone scoring was used. Complete directions for constructing an attitude scale are given in this monograph.

Comment

The reviewer ventures to offer the following suggestions for the improvement of some studies of social attitudes:

1. Let the study be an outgrowth of activity and thought in connection with major social needs. Scientific resources are too limited to be wasted upon the inconsequential.
2. Let the subjects and situations more frequently be found outside of college classrooms.
3. Let those data be collected which will check some hypothesis—one which has a good chance of being both true and significant. The random collection of personal data and test scores for correlation seems never to bring rich reward.
4. Let there be more attempt to find indices of social attitude which arise and validate themselves in the activities of the economic, political, and social struggles. Psychologists and educators have shown an inexcusable addiction to paper and pencil.
5. Let the necessary scale be constructed after much more thorough, intimate, and discriminating acquaintance with the best scholarship concerning the issue. Many of the so-called "radical" positions in existing scales, for example, would be disowned by any intelligent radical.
6. Let the refinements of accuracy in mathematical units wait until the many errors which common sense could eliminate have been removed. Statistical attack has too often substituted for, rather than followed upon, intelligent and thoughtful analysis of the actual behaviors involved.

CHAPTER VIII

Measures of Character and Personality Through Conduct and Information

THE studies for the period have been treated in four large divisions. The first includes publications primarily concerned with contributions to method. These are discussed under the headings of systematic observation, ratings, tests, expressive movement, psychogalvanic measures, physiological factors, inventories, and factor analyses. The second division represents an alphabetical arrangement of characteristics, traits, or constellations of behavior in which the investigator has been interested. The patterning of character and personality measures has been reserved for the third section. Studies stressing the prediction of achievement and the relationship between variables are included here. Investigations of the effect of direct or indirect instruction on knowledge or modification of behavior have been discussed in the fourth large subdivision.

CONTRIBUTIONS TO TECHNIC

Systematic Observation

Growth in the development of time-sampling technics was described in the summary of seventy-six titles by Olson and Cunningham (1997). The emphasis on overt behavior and the range of problems attacked was illustrated in a list of thirty-eight categories of behavior to which the approach had been applied. Practices employed in time-sampling studies were discussed under the following headings:

1. Definition of behavior: action criterion, impression criterion, social-stimulus criterion, unit of behavior, category
2. Timing and sampling: time-sample, distribution of time-samples
3. Distribution of observer's attention: individual observation, group observation, scanning
4. Method of recording: intermittent recording, continuous recording, photo-recording
5. Method of scoring: time-sample score, frequency score, derived score
6. Conditions of observation.

Bott (1889) has summarized in discussion and tabular form the practices in some of the major observational studies as to the selection of categories, the quantification of measures, devices for recording, methods for measuring reliability, and methods of expressing results.

The development of recording technic has been illustrated in the stilled motion pictures of D. S. Thomas, Loomis, and Arrington (1920), the photo-sampling of Olson and Wilkinson (1995), and the intermittent photography of Swinton (1918).

The period has also witnessed an increased advocacy of what might be termed anecdotal, diary, or journal types of recording. A single observation represents measurement in the sense of presence or absence, and may preserve more of the matrix from which the behavior emerges than more delimited or controlled observations with established reliability. In general, such observations have been employed for their guidance and counseling values rather than for measurement, research, or controlled appraisal. Notable studies have been made and others are in progress making more systematic use of records of incidental material. Space requirements and the task of this *Review* have dictated the elimination of the numerous studies pursued by informal methods of observation.

Ratings

Rating methods have very definitely grown in favor during the period covered by this *Review*. Weiss (1025) reviewed 131 titles dealing with both self-ratings and ratings by others. Her opening paragraph is of interest:

Whether we like it or not, rating scales are forging their way into research circles. Not only are they of value in lieu of more objective measures, but they are being found applicable themselves with a relatively high degree of objectivity. The supposed death blows first dealt them by Rugg and Thorndike have proven only temporary checks. What then seemed unavoidable flaws have now been found remediable through development of new techniques (1025: 185).

Conrad published a series of articles (906, 907, 908, 909) in which he discounted the importance of many of the factors which have been regarded as disadvantages of the rating method. His setting was the nursery school where superior conditions for observation exist, as contrasted to the casual limited contracts typical of certain work or educational situations at later levels. In addition to showing that valid and reliable data may be secured, he called attention to a problem which has been somewhat overlooked in rating. Studies hitherto have tended to emphasize differences among traits, among raters, and conditions of rating. By treating the trait ratings on each subject as a sample, he is able to show that the reliability of rating is in part a function of the child; i.e., some children can be rated reliably, others not so reliably, and a given trait may be rated reliably in a child of outstanding characteristics, and unreliably where the trait is not particularly applicable to the child.

The trend from both direct observation and rating suggests that an eye-witness record of behavior or a rating judgment based on the impression from a series of events may possess more validity than an abstracted questionnaire or test instrument from which one must infer a relationship to the behavior. The disadvantage of the direct approach is the inconvenience of securing the record and the inaccessibility of certain aspects of the experience and personality to direct observation.

Tests

Investigators have continued to employ the tests, or modifications of test technics, developed by May, Hartshorne, Maller, and others. The Character Education Inquiry was largely completed and reported in the *Review of Educational Research* for June, 1932, on character and personality tests. The new tests involving performance or information have been reserved for topical treatment later in the chapter. Measures involving self-rating or reporting have been described in the two preceding chapters.

Expressive Movements

An increasing number of attempts are being made to generalize more widely on the specific data of peripheral expression so as to regard voice, gesture, graphology, and movement as reflections of well-organized dispositions in personality. The descriptive and analytic studies have been omitted in conformity with the general purpose of the present *Review*. The journal, *Character and Personality*, is the most prolific source for both European and American contributions to the study of expressive movement.

A survey of the literature and experimental work in the book by Allport and Vernon (877) constitutes a useful beginning for students of the problem. Part A treats the problem of the consistency of individuals in respect to their style of expression and their habits of gesture. Experiments were conducted to measure speed, tension, extent, variability, pressure, and other peculiarities of natural movement. Intercorrelations were presented between a variety of measures in search for group factors. A need was shown for the interpretation of certain types of data in terms of psychological equivalents, for there was some evidence that "measures which do not correspond statistically may nevertheless be congruent psychologically." Part B reviews critically recent experimental work in graphology and presents two experiments designed to test the skill of graphologists and laymen. The writers have a feeling that perhaps too much has been claimed for graphology by graphologists and too little by psychologists. Both gesture and handwriting reflect an essentially stable and constant individual style. Experimental material on handwriting has been brought into closer relationship with personality traits (899, 943), or given special study from the point of view of the reliability of interpretation of the material itself.

In general, studies of body type have been excluded from the present *Review*. From the point of view of expressive movement, however, the traces left in the face by habitual expression, typical posture, and methods of walking and running must be regarded as evidences which can be tested, even though the validity for personality study is not always clear or demonstrated.

Blake (888) studied bodily expression, excluding the face except as added information for the interpretation of the data. Subjects were supplied with five sheets with nine pictures on each sheet. The sheets represented the human figure in various poses, and with the figure divided so that ex-

pressive movements by head and shoulders, torso and arms, feet, legs, and hips, full figure without face, and full figure with face could be studied separately. For each sheet, the subject was required to give nine responses as to whether the figure showed horror, frenzied anger, feebleness, tenderness, antagonism, stealth, egotism, embarrassment, or resignation. He concluded that one tends to interpret certain bodily expressions as indicative of certain dominating mental or emotional states, and that the ease of so doing increases as the number of bodily agents involved increases. Further, he contended that there is an improvement with training, and that adults exceed children in the ability. Blake pointed out that, regardless of origin, bodily expressions constitute a part of the problem of human relations and may be developed or modified consciously for these ends.

Further evidence of the importance of expressive movement is found in the study by Goodenough (934) of the judgment of emotional states in infancy. Eight photographs representing infantile emotions were submitted to 68 students in child training courses, together with descriptions of the states. The students were required to match the pictures with the descriptions. Correct judgments were made in 47.4 percent of the cases, which is 5.7 times the number expected by chance. It is possible that such emotional expression may be more readily observed before the age of learned inhibitions and substitutions.

Psychogalvanic Studies

The psychogalvanometer has played and is playing an important role in the literature of personality studies. Landis (963) reviewed 247 titles covering the literature from 1929 to May, 1932. It is clear from the review that persons interested in applied uses cannot expect much immediate help from these instruments. The interest and value of the technic from the point of view of research are obvious. Landis' conclusion for the time being is of interest:

From this literature, giving the results and conclusions of many investigators, the reviewer is convinced that there is really no adequate evidence that these electrical phenomena of the skin are of necessity associated with any psychological event. They are, as Wang pointed out, strictly physiological in nature and probably have a marked and important psychobiological significance. There is really no justification for anyone using any present galvanometric technique or method as a measure of, or a criterion of any of the traditional psychological categories, personality traits, or social relationships of the individual (963: 275).

Many investigators have found, as in the case of Darrow (968: 57-261), that the correlations between various questionnaires concerning emotionality and the psychogalvanic responses often tend to be sufficiently large to indicate a group trend, even though not significant for individual prediction.

Physiological Studies

Investigations into personality by physical and physiological technic were reviewed by Larson and Haney (966). They submitted a lengthy

bibliography and described some of their own work by means of the polygraph technic (see later section on lying). By using a falling chair device, Ray (1007) demonstrated that real changes appear in the pulse rate, respiration, and inspiration-expiration ratio of children. Investigators interested in body chemistry as indexes to personality should examine the review by Rich (1008). Acid-base equilibrium and creatinine production appeared to be definitely related to emotional excitability, although the explanatory interpretation is not yet clear. Experiments dealing with calcium and phosphorus have usually been equivocal or negative. Children showing behavior problems appeared to be somewhat more likely to show endocrine disorders according to the investigations of Rowe (1011).

Reference should also be made here to the attempt to relate food and character (885) and to the compilation of references to psycho-dietetics by Fritz (928).

Inventories ✓

Inventories furnish a point of departure for the construction of various types of instruments for the study of character and personality. Useful ones have been prepared by Ackerson (873, 874) on the basis of behavior problems of children, by Conrad (905) for behavior ratings of nursery school children; by Krout (962) for gestures; and by Allport and Vernon (877) for expressive movements. Baumgarten (882) listed an inventory of character traits with 1,629 terms in connection with her study of character traits. The social setting of personality problems was emphasized in Cantril's review (900) of 306 titles which cover such topics as fads and fashions, conversation, humor and laughter, imitation, suggestion, creeds, revival meetings, legends, patriotism, gossip and rumor, religious cures, friendships, leadership, customs, clothing, newspapers, radio, race attitudes, language, revolution, and industry.

Factor Analysis

Thurstone (1021) reported his work on multiple factors in his presidential address before the American Psychological Association in September, 1933. He pointed out the inadequacies of Spearman's two-factor or single-factor method in accounting for the multi-dimensionality of mental traits. As illustrative material, he employed a number of specific studies of personality—one on a list of sixty adjectives descriptive of personality, which yielded five group factors; one on the insanities, with the whole range of psychotic symptoms reduced to five clusters; another on the vocational interests of college students; and a fourth on radicalism as a common factor. Spearman has published requests in several countries for cooperative work in personality investigation. Studies under the plan have been begun in the United States.

Maller (980) has studied the intercorrelations of four growth scores for honesty, cooperation, inhibitions, and persistence, contained in a study

by Hartshorne, May, and Maller. They are uniformly positive and suggest the presence of a general factor in character. The writer believes that this general factor is the readiness to forego an immediate gain for the sake of a remote or later gain.

Jenkins and Ackerson (956) described card-sorting methods for tracking down types of clusters of individuals with characters in common. The method is applicable only to large bodies of data. As applied to behavior problems of children, it is possible to secure clusters of items in which the obtained frequency of association exceeds the chance expectancy.

CHARACTERISTICS, TRAITS, AND CONSTELLATIONS OF BEHAVIOR ASCENDANCE-SUBMISSION

Self-report methods of describing ascendancy-submission, extroversion-introversion, domination-compliance, or similar characteristics are included in another chapter of the *Review*. Jack (955) investigated ascendant behavior in four-year-old children by means of an experiment made up of a series of pairings. Factors differentiating between the upper and lower third were studied.

By comparing the actual performance of sixteen nursery-school children in six test situations with their self-assurance in these situations, Emmons (920) found that self-assurance was positively correlated with skill, age, and intelligence.

Delinquency

Several new instruments for the measurement of delinquent tendencies have appeared and a much larger group of studies describe the application of earlier tests and ratings to groups of children differentiated as problem and non-problem or delinquent and non-delinquent. Loofbourow and Keys (973) published a battery of four tests known as the Personal Index. The battery was based upon a study (974) in which ten group tests of behavior tendencies were applied to reformatory inmates, to groups of junior high-school boys designated as disciplinary problems, and to public school boys of like age and intelligence. Burrow (894) developed a social rating sheet containing twenty-five desirable attitudes and traits for the study of behavior problems among backward pupils in a special school.

The research literature developing about the use of the Haggerty-Olson-Wickman Behavior Rating Schedules has been summarized to April, 1933 (998). Statistical inquiries and clinical uses in schools, courts, and guidance clinics are described. It seems clear that the schedules have validity for the prediction of the constellations of behavior which bring children into conflict with the mores of social groups and with the machinery of the juvenile court.

Delinquents have been found to have a higher social participation rating than non-delinquents (879), and to secure markedly higher average scores

on the Sims Scale (1019). Holsopple (953) suggested that recidivism may be related to an inability to inhibit or unlearn behavior habits. There is some evidence for a small group that mirror drawing is an index to this ability.

The studies contrasting delinquent and non-delinquent children furnish interesting material on the general question of the validity of personal report methods as contrasted to rating, and as to the relationship between knowledge and conduct. Using the personal report method, Babcock (880) failed to find a differentiation using Attitude SA Test, Sweet Test of Personal Attitudes in Young Boys, Roger's Test of Personality Adjustment for Boys, and various perseverance tests of Stevenson. Mira (987) concluded, on the basis of tests involving information, ethical discrimination, and conduct, that: "These data demonstrate that the correlation between the tests of theoretical conduct is small; that between theoretical and real conduct is nothing; and that between the tests of actual conduct in face of situations which require the possession of the same moral characteristics but expressed in two different forms (action in one case and inhibition in the other) is highly satisfactory."

The differential capacity of twenty-four different tests was studied by Casselberry (901). The index finally obtained apparently is predictive of success on parole. He found the Laslett-Casselberry Free Association Test one of the most discriminating items in the battery. However, Gilliland and Eberhart (932) did not find such clear-cut differences on the Laslett test in comparing four groups representing different degrees of delinquency in the Chicago area. They surmised that there may be considerable differences in the vocabulary of delinquents in different parts of the country, which may interfere with the comparability of the results.

Hill (951) measured the extent of cheating by a technic similar to that used by Hartshorne and May. Delinquent children in a reformatory were differentiated from a problem group of junior high-school boys and from a group selected as well adjusted. There was little difference, however, between the two high-school groups.

Inconsistencies in the differential capacities of the same test in different studies are probably attributable to variations in the extent to which age, sex, and mental ability have been controlled. In certain instances, a spurious differential capacity has undoubtedly been attributed to certain tests by basing the conclusions on the criterion group which was employed in its construction. In such a comparison, a newly constructed test will show up favorably as compared to others, and may fail to hold up equally well in new applications.

Character and Personality Scales

Many of the rating devices intended for use in the home and school are organized in batteries designed to give a many-sided description of personality. They cannot, conveniently, be treated under a topical organization.

Hayes (945, 946) published a scale for evaluating the school behavior of children ten to fifteen. Raters are asked to check a series of state-

ments concerning each child. The statements are concerned with relations to others, to the rights of others, to teachers, to other pupils, initiative, health habits, general interest, scholarship, and study habits. The items are scored in terms of weights based upon the judgment of experts as to their desirability or undesirability for character or personality development. The scores are then translated into percentile ranks by divisions and a profile constructed. The same principle was employed in a variation of the scale having an age range of nine to fifteen and designed particularly for parents (944). An extension was later developed by Hicks (949) for use by parents of children six to nine.

Maller (979) developed a rating scale including fifty aspects of character and personality. Each is followed by a brief description divided into three sets—low, average, and high. The actual rating is done on the record blank which accompanies the scale. Williams (1026) analyzed essay reports by teachers as a basis for the construction of a rating form for pupil adjustment in a laboratory school.

Developmental Age

Furfey's previous test for developmental age has been revised to simplify scoring and increase reliability (929). The test consists of 196 pairs of items on things to do, things to have, books to read, etc. The subject chooses one of each pair. Developmental age as determined by shift in choices does not appear to increase after sixteen. Developmental age equivalents for scores are reported. Reliability of the revised test ranges from .85 to .96 in the various age groupings.

Measures of developmental age are now available for girls. Plechaty (1003) reported a preliminary form of an objective scale for measuring developmental age in grade-school girls. Sullivan (1017) described a scale based on characteristics and changing interests of girls from seven to eighteen years of age. The method of choice of paired comparisons was again utilized. Developmental age increased steadily to the sixteenth year in girls, with no abrupt change at puberty. Changes are not so regular after the sixteenth year.

Emotions

The amount of tension in the muscles of the used and unused hands, while making responses to pictures and while tapping, was shown to be related to ratings on excitability and to school adjustment in the investigations by Duffy (915, 916, 917). Tension in the hand muscles was measured by a dynamograph. Such a measure may be useful in determining which individual frequently manifests a highly aroused state. By combination of time-sampling and graphic rating, Lee (971) concluded that instability of mood and mood level were measurable characteristics of nursery-school children. Goodenough (933) quantified data on the frequency, duration, causes, and methods of handling anger outbursts of children in the home.

Eating Behavior

Eliot (919) studied the personality pattern which differentiated finicky and non-finicky eaters in nursery schools. A rating scale of thirty-one items was developed in which trait names were used but in which the quality to be rated was described in terms of habits of action. Thirteen out of thirty-one traits were found from which reliable distinctions were obtained. Finicky eaters among two- or three-year-old children seemed to have poorer general health, to be more emotional, self-assertive and self-expressive, and less well adjusted and happy than non-finicky eaters.

Friendship and Quarreling

Friendship and quarrels have been a popular topic for investigation by students of preschool children. The usual approaches involve variations of time-sampling and systematic recording which define friendship and companionship on the basis of propinquity and frequency of associations. The measured data have been interpreted in the light of sex differences, age differences, and other measurable characteristics of the children, see Challman (902), Green (936, 937), and Hagman (939). Mengert (984) secured measures of friendliness and unfriendliness in a group of two-year-old children by pairing each child with each of the other children and noting their reactions.

With older children, Flemming (925) demonstrated a similarity between the scores of students and best friends on various measures of personality, intelligence, and social status.

Honesty

G. F. Miller (986) intentionally misscored the test papers for two groups of college students. The students were then given an opportunity to correct their papers with a key. One-fourth of the total papers had been scored too high by the instructor and another one-fourth too low. He was thus able to note the extent to which students would correct errors which raised their scores as compared to errors which lowered their standing. The percent of honesty was 7.7 for a younger group of students and 58.3 for a more mature group. Tuttle (1024) obtained a measure of honesty in terms of changed answers in a well-motivated school contest involving over 2,000 children in the elementary grades of thirteen different schools. The results indicated a high correlation between honesty and intelligence and an increase in honesty from grade to grade. Data by schools are construed as indicative of a relationship to geographical area. E. H. Moore (989) described a method for measuring honesty in classroom performance.

The Presseys (1004) compared the honesty of Indian and white children in the third, fourth, and fifth grades as measured by the scoring of an arithmetic paper, handling money, performance with the eyes closed, and individual records of results on the hand dynamometer. In general, Indian

children appeared to be less honest than white and there was a decrease of dishonesty with age.

General interest in the detection of crime makes the monograph by Larson and others (1967) on the detection of lying particularly timely. Questions are given to the subject to which he must respond by "Yes" or "No." The inference as to lying or guilty knowledge is made from a polygraph record involving pulse rate, blood pressure, respiratory rate, and the psychogalvanic reflex. The instrument employed was based upon earlier devices with improvements by Larson and Darrow. At times the record has been used to obtain a confession. Devices of this type are being brought into general use over a wide area, and their validity and reliability have probably been exaggerated in popular thinking. The sensitiveness of the instrument to a variety of physical and physiological changes makes it desirable to restrict its interpretation to skilled persons.

Humor

Humor scores were obtained by Landis and Ross (1964) by asking subjects to rate a carefully selected list of 100 jokes as to excellence. No significant relation was found between the humor score and intelligence or introversion.

Leadership and Popularity

The time-sampling method was employed by Parten (1999) in a study of leadership among preschool children. Even at the preschool level there appear two types of leaders—the diplomat and the bully. The former controls a large number of children by indirect suggestion; the latter employs force.

Koch (1960) used the method of paired comparisons applied to expressions of preference by members of a nursery-school group of children to obtain a popularity score for each child. These scores correlated .76 with the ranking made by the teacher. Popularity scores tended to be higher for girls than for boys and positive correlations are shown between the measure and compliance with routine, respect for property rights, a tendency to ask for commendation, and a tendency to tattle.

Leadership among adolescent boys has been studied by Partridge (1902) in the summer camp and scout troops by means of a five-point man-to-man rating scale. Leaders were found to excel their fellows in all measures of mental and physical traits but did not tend to fall into definite types. The bibliography of 143 titles is of value to the investigator. Jenny's study (1957), using tests and attitudes scales, indicated that in the summer camp the most acceptable boys were well adjusted, resourceful, and capable of leadership. Non-acceptable boys tend to be problem cases.

In Garrison's investigation (1931) students were given instructions to list in order the five individuals of the class, boys or girls, that they admired most. A leadership score was obtained by means of weighting positions held in high school by each senior during the past three years. Marked

correlations were found between the admiration score and the leadership score and significant relationships between scholarship and leadership scores. A small correlation was found between the father's occupational rating and the leadership score.

Flemming (926) obtained pleasing personality ratings from classmates. These ratings were then correlated with other measures and ratings of traits obtained from the teachers. Pleasing personality was found to be positively related to intellectual enthusiasm, capacity for independent thought and for independent work, industry, persistence, social adaptability, rejective ability, dependability, self-control, and good manners.

Cowley (910) gave 12 psychological tests to 112 subjects consisting of criminal leaders and followers, non-commissioned officers and privates in the United States Army, and student leaders and followers. In general, leaders rated themselves higher in self-confidence. They scored higher in motor impulsiveness and took an appreciably shorter time to: (a) determine whether their decisions would stand; (b) arrange a set of mottoes about tact; (c) call out the length of lines on a pack of 70 cards; and (d) arrange a set of mottoes about aggressiveness.

Negativism

The resistant, acquiescent, and aggressive behavior of thirty-six nursery-school children toward other persons was measured by controlled observation of activities, by stenographic reports of language, and by records of each child's behavior during intelligence tests (897).

A test for susceptibility to majority opinion was devised and presented by Barry (881) on the basis of earlier work by Moore. Individuals tend to change previous judgment to conform to the majority opinion. Striking individual differences were found in susceptibility. "S" was designated as a measure of negativism and compliance. Persons with low scores in "S" tended to be critical, derogatory, and irritable, and persons who were themselves irritable tended to rate others in a similar fashion.

"Only" Children

Theory has tended to emphasize the importance of being an only child as a personality determiner. Campbell (898), in summarizing 75 titles on the problem, concluded that research, both clinical and non-clinical, gives less and less support to this viewpoint. More analytical and well-controlled investigations are needed to establish the significance of "onliness" as such (also see discussion in Chapter VI). Witty (1027) studied 153 only children five years of age. Comparisons were made between ratings and measurements of this group and various control groups. Only children show themselves superior to other children in health, physical development, intelligence, and character traits.

Play

Play furnishes a rich setting for observational and experimental studies of character and personality. There is apparently no tendency to study play as a continuum of personality in itself. Factors which make for participation or lack of it have been investigated. Hurlock's review (954) of 128 titles of experimental investigations of childhood play are the readiest source for the student.

Recklessness

Burt and Frey (895) have developed a battery of tests for the measurement of recklessness. The tests involve such things as balancing a long rod, putting nuts on machine screws, and filling graduates with water to a designated mark. The criterion with an estimated reliability of .86 was obtained by means of a graphic rating scale. The items of the test, properly weighted, correlated .60 with the rating. Factor analysis of the inter-correlations suggests that the principal element is one of haste.

Social and Ethical Information

Several instruments for the measurement of knowledge of social standards have appeared during the period. That by Tomlin (1022) is applicable to children in grades four to eight. Reliability and validity data are supplied.

The test of social usage by Strang, Brown, and Stratton (1016) is particularly applicable in junior and senior high school. It covers table manners, taste in dress and appearance, good manners for the guest and host, good form in relation to others in social and play situations, and respect for property. Strang (1015) demonstrated that there is an increase in knowledge with age and grade, a positive correlation with intelligence, and a significant difference in favor of children whose parents belong to professional groups. No data have been supplied to validate either of the foregoing tests in terms of overt action.

The Shields' Moral Judgment Examination (972) yields an age score called "age of responsibility." The test involves vocabulary, comprehension in ethical situations, definitions, offense comparisons, sentence construction, and judgment.

The ethical concepts and feelings of 20 boys thirteen and fourteen years of age, were given intensive study by Hermsmeier (948). Evaluations made by the experimenter on the basis of test situations show a high correspondence with estimates of parents and teachers. Ethical concepts were tested by the use of definitions, the subsumption of anecdotes, under concepts, and the differentiation of paired examples of ethical qualities. Eight other methods were also used to arrive at measures of ethical feeling or information.

Socio-Economic Factors

Chapin (903) developed a Social Status Scale, 1933, which is briefer and simpler than the Living Room Scale, 1931, while still comparable in reliability and validity. An abbreviated form based upon the personal report method of the Sims scale was prepared by Wrightstone (1031). A scale for social adequacy was developed by McCormick (976, 977) on the basis of the type of data sought by social workers.

A plan for scoring the opportunities provided by parents for the development of money experiences of children was presented by Hanson (941).

Studiosness

It would appear that only a few of the many procedures advocated for methods of study actually differentiate between superior and inferior college students. Using self-ratings, Eurich (921) studied the relationship between study habits and achievement. Nine of the characteristics apparently differentiated well between groups of superior and inferior students.

Wrenn and McKeown (1028) selected the study habits which differentiate best between students equal in intelligence and unequal in scholarship. These have been published in their *Study Habits Inventory*. The items are weighted in terms of their differential capacity and yield a total score to describe the adequacy of the student's general work habits.

Vocalization

With the development of radio broadcasting, renewed interest has been evident in the judgment of personality from the voice. Allport and Cantril (876) had listeners judge both physical and personality traits by listening to the natural and broadcasting voice of the speaker. They concluded that the voice does give some correct information concerning the outer and inner characteristics of personality. The tendency toward stereotypy is shown in the fact that uniformity of opinion is somewhat greater than accuracy as judged by actual measured data on physical and personal traits. There was more consistency and correctness in the judgment of inner characteristics than in the judgment of outer characteristics.

Time-sampling technics applied to the measurement of talkativeness in children have demonstrated that reliable measures may be secured (1010). The study by Robinson and Conrad differs somewhat from that of Schubart (1012). In the former, presence or absence of talking in a given time period was the unit of measurement, while in the latter a mechanical counter was also used so as to secure a measure of total output and rate.

Brackett (891) found that the laughing and crying behavior of preschool children could be measured reliably by the use of direct observation and short-time samples. Laughter appeared to be a highly consistent pattern of behavior in varying situations and is somewhat more social than crying. Laughing tendencies increased with age in the preschool group while crying

decreased. Justin (958) investigated laughter-provoking stimuli over an age range. Her method of procedure, involving timing, permitted quantitative measures with a consequent study of age change in relation to other characteristics such as intelligence. Thirty-six references add to the value of the study for the investigator. Kenderdine (959) also studied laughter in the preschool child. Ding and Jersild (914) have reported on the same behavior in the Chinese.

Shirley (1013) measured manifestations of irritability in infants during physical, anthropometric, and psychological examinations. An elimination of screaming, crying, fussing, etc., is shown with age during the early days, weeks, and months. Timed records of laughing, crying, etc., were used by Bridges (893) as measures of emotionality in infants.

THE PATTERNING OF CHARACTER AND PERSONALITY MEASURES

Achievement

The unique contribution of character and personality data to the prediction of achievement has been the subject of a number of investigations. The negligible relations between symptom questionnaires and achievement have been noted in Chapter VI. These are in contrast to the definite relations found by the use of action criteria.

Sorenson (1014) made a correlational analysis of the relationship existing between academic grades, industrial grades, intelligence, mechanical ability, mechanical interests, and problem tendency scores on Schedule B of the Haggerty-Olson-Wickman Rating Schedules in a study of junior high-school children. He found the highest correlation between the intelligence test and average grade (.62), with the relation to Schedule B scores next (-.55). Marks could be predicted three semesters in advance with Schedule B, with only slightly less accuracy (-.51) than that for the semester in which ratings were secured. Schedule B scores, academic grades, and paper form board scores predicted industrial grades about equally well. By partial and multiple correlation technics, Sorensen concluded that scores on Schedule B give a unique contribution to the prediction of school marks in a junior high school.

Turney followed his intensive monograph report (1023) on the relationship between character traits and achievement with a series of articles. In general, he concluded that between marks and the traits of industry, perseverance, dependability, and ambition, the correlations are as high or frequently higher than the correlations between I. Q. or mental age and marks. The correlations between traits and marks are but little affected when intelligence quotient or mental age is held constant. He held that the ratings are real measures of aspects of the personality which contribute to achievement. Intercorrelations between ratings and intelligence, vocabulary, scholarship, honesty rating, and objective test rating were made by Garrison and Howell (930). Reliable positive correlations were found between the various character traits and scholarship.

Hicks and Hayes (1950) used a coded time-sampling method to record the verbal responses of junior high-school pupils in classroom discussions. The verbal responses were classified in terms of their content in subject-matter and the extent to which they represented desirable and less desirable aggressiveness. These values were then compared for four groups of children made up on the basis of combined ranks in general intelligence, school achievement, and general personality traits. Command of subject-matter and desirable aggressiveness were characteristic of the higher groups, and lack of command of subject-matter and undesirable aggressiveness were characteristic of the lower groups.

McElwee (1978) contrasted accelerated, normal, and retarded children in a public school on a checklist filled out by teachers. On the average, the accelerated children seemed to possess a greater degree of all the desirable traits than did the retarded children. Laycock (1970) contrasted superior and inferior children on ratings of maladjustments made by teachers and ratings made by himself on the basis of personal interviews with the children's parents. In general, the superior group received more desirable ratings by both approaches.

The trend in secondary schools has been confirmed by Hartson (1942) at the university level. He gathered data for 500 students on college freshman grades, high-school grades, psychological examinations, and ratings for eleven items in a personal rating scale. The eleven items had been rated by the students' high-school principal, a teacher, and a friend. Personality ratings correlated better with scholarship in high school than in college, and ratings by the principal correlated better than those by the other judges. The personal estimate as a whole yielded higher correlation with college grades than did high-school grades or intelligence test scores. A combination of high-school grades, intelligence scores, and personal estimate proved to be a better measure for predicting college scholarship than any one or a combination of two of the above items.

Ratings of twenty-five students by twenty-five others for beauty or physical attractiveness were found to correlate only very slightly with scholarship and not at all with intelligence in an investigation by Mohr and Lund (1988).

It would appear that most external approaches to the evaluation of conduct and personality make a unique contribution to the prediction of general educational achievement. The evidence suggests the existence of a basic patterning and a possible central relationship in which achievement is but one of a number of peripheral expressions of the adjustment of the organism.

Complex Interrelationships

Typical studies in the patterning and interrelationships of behavior involve measurement by short-time samples in social situations for a series of definable aspects of the total, including such matters as language, type

of participation, amount of physical contact, etc., with further analysis by sex, age, and other measurable characteristics (878, 884, 935, 994, 1000).

Bott (890) gave intensive consideration to the problem of interrelationship in observational studies of social and material activities, verbal and motor activities, social relations among children, relations with adults, and personal activities.

THE MODIFICATION OF INFORMATION AND CONDUCT

Applications of measures of character and personality in the determination of the result of both direct and indirect approaches to the modification of character are increasing in number. The extent of this trend is probably not entirely apparent in current publications. An examination of lists of unpublished master's theses shows large numbers of small studies.

Reviews

The obligation of the present *Review* for a report on applications is reduced since the December, 1934, issue, devoted to psychology and methods in the high school and college, has a chapter on moral and character education by Symonds and Kirkendall. Some overlapping exists in the present account where desirable for the sake of continuity. Changes in attitude are discussed in Chapter VII of the present number of the *Review*.

General summaries of practices with technical evidence are available through bulletins of the Research Division of the National Education Association (993) and through yearbooks of the Department of Superintendence (992) and the Department of Classroom Teachers (991). Heaton (947) has produced a convenient exposition for practices and sources.

Direct Instruction

Clevett (904) secured positive findings in increased honesty in athletic contests (used as test situations) in an experimental group in which experiences had been utilized as the basis for a discussion of problems of character. The control group had a very formal program with no conscious character education. Zyve (1033) called attention to the somewhat specific character of the outcomes in honesty which accrue through the utilization of examination situations for instruction in integrity.

The work book by Charters, Rice, and Beck entitled *What's the Right Thing To Do?* was experimented with as direct instructional material by Cressman (911). The one group of seventh-grade pupils used the work book for self-study, a second with presentation and discussion of the problems by the teacher, and a third was used as a control. Character tests from the work book and from the Character Education Inquiry were given before and after the training period. Both instructed groups showed improvement and the one with the heaviest reliance on the work book ranked the highest.

Fifteen periods of thirty minutes each devoted to a study of principles of honesty produced some differences in information as contrasted to a central group in Hobson's study (952).

An increase in critical thinking was demonstrated by Biddle (887) as a result of a study by pupils of methods used in current propaganda. Experimental and control groups were used from the eleventh, twelfth, and thirteenth grades. Tests on gullibility were given before and after. A significant improvement was found in the experimental group as compared to the control group.

Robb and Faust (1009) found small but consistent differences in favor of an experimental group as a result of eight weeks' instruction in ethics in one section of a civics course as compared to another which had the usual instruction in problems of democracy. A second experiment with two groups of ninth-grade children, one of which received eighteen home-room programs devoted to the presentation and discussion of moral problems, resulted in inconsistent results. Lectures and conferences on the qualities and technics of leadership produced increased gains in experimental as contrasted to control groups in the investigations of Eichler and Merrill (918). Leadership was measured by the ratings of classmates.

Indirect Instruction

Participants in athletics achieved greater gains than spectators or non-participants in six tests from the Character Education Inquiry in one school, but failed to be differentiated from non-athletes by teacher ratings in two others (938).

Allen (875) analyzed the character outcome accruing in two methods of teaching plane geometry. One group was taught by the traditional recitation method and the other by individualized instruction. He concluded that the individual instruction group was definitely superior at the end of the year in mathematical achievement, with small but consistent gains in the direction of more emotional stability, extroversion, submission, self-sufficiency, honesty, broadmindedness, and less mathematical interest. Students of Latin scored higher in civic attitudes, pacifism, and liberalism in the investigation by Meek (983).

Mayberry (982) compared members of student councils in high schools with a similar number of paired students not members of the council. The results indicate that the council group was superior in the characteristics measured by the Upton-Chassell Citizenship Scale.

The relation of newer practices in schools to character and other outcomes was described by Wrightstone in a series of studies. Experimental practices in the social studies, for example, may be employed to develop students in the direction of liberal civic attitudes and beliefs (1030). A number of articles have been devoted to methods of appraisal (1029). The monograph report, which is now available, falls properly in the period of the next cycle of the *Review*.

Motivation

Cooperation and honesty tests were given to 215 pupils in grades seven and eight under both personal and social motivation (981). In general the subjects worked at a higher efficiency and were more deceptive when the score was to count for personal gain than when it was to count as a gain for the group. The same trend was reported by Forlano (927).

Effect of Organization Membership

Boy Scouts were not delinquent as often as non-Scouts in Fairchild's investigation (922) of 500 Scouts and 500 non-Scouts from ten communities. Scouting, however, cannot be credited with the differences since they tend to disappear when an equation for socio-economic factors is made. The same trend appears in ratings based upon twelve traits of character included in the Scout Law. The Fairchild investigation has been summarized by Dimock (913) with suggestions for desirable extensions.

Feder and L. W. Miller (923) attempted to evaluate certain phases of a comprehensive program of character education for boys. The "X" plan involved military training and an intensive program of active club work in which the children had participated for a period of from two to five years. Comparisons were made with health tests, citizenship tests, attitudes toward war, and behavior ratings. Boys trained under the "X" plan did not differ materially on the above measures from boys in general.

Summary

A detailed reading of the experimental studies on the modification of information and conduct impresses one with the dominance of individual differences over experimental factors operating through brief periods of time. Differences in persons at the beginning of experiments are usually greater than changes which can be expected. The experimental differences secured are often small and specific or inconsistent. No evidence has appeared which demonstrates that character or personality can be easily or rapidly modified. Some shifts in attitudes and information have been demonstrated with direct and indirect approaches. Future investigations should strive for larger samples, more complete appraisals of changes in information, attitudes, and conduct, and longer periods for the operation of the experimental variables.]

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Chapter II. Applications of Intelligence Testing

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Chapter VII. Social Attitudes

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